Detailed Project Report

Draft

Upper York Creek

Ecosystem Restoration Project
Napa County, California

U.S. Army Corps of Engineers, San Francisco District, South Pacific Division
City of St. Helena, Napa County, California

INTRODUCTION

The U.S. Army Corps of Engineers, San Francisco District (Corps), and the City of St. Helena, California, the project's non-Federal sponsor, propose to remove or modify Upper York Creek Dam and appurtenances, remove accumulated sediment, and restore the local ecosystem structure. Removing or modifying the dam would improve fish passage for the federally listed steelhead *(Oncorhynchus mykiss*), would reduce the potential for future downstream sediment releases and fish kills, and would allow for the restoration of approximately 3 total acres of degraded riparian and riverine habitat surrounding Upper York Creek Dam.

This report presents the findings of the alternatives analysis and the selection of a recommended plan for the Upper York Creek Ecosystem Restoration Project.

EXISTING CONDITIONS

The Upper York Creek Ecosystem Restoration Project is located within the five-square mile York Creek drainage basin, to the northwest of the City of St. Helena, Napa County, approximately 60 miles north of San Francisco. York Creek is a tributary to the Napa River, which flows to the Pacific Ocean via San Pablo Bay. The creek flows in an easterly direction through a narrow canyon before joining the Napa River northeast of the city of St. Helena in Napa County at an elevation of approximately 225 ft.

The project site includes the Upper St. Helena Dam (Upper York Creek Dam), Upper York Creek Reservoir (Upper Reservoir), and the Lower York Creek Reservoir (Lower Reservoir) on York Creek (See Figure 1). The Upper York Creek Dam is a 50-foot high, 140-foot long earthen dam that was completed in 1900 and is located approximately 1.5 miles upstream of the City of St. Helena. The Upper Reservoir, though now abandoned as the result of siltation, was originally used for water storage. The Upper York Creek Dam and Upper Reservoir, combined, cover approximately 3 acres. Lower York Creek Reservoir is located about one mile down Spring Mountain Road from the Upper Reservoir that is currently utilized as an untreated water supply to meet a portion of the City's irrigation and construction water demands.

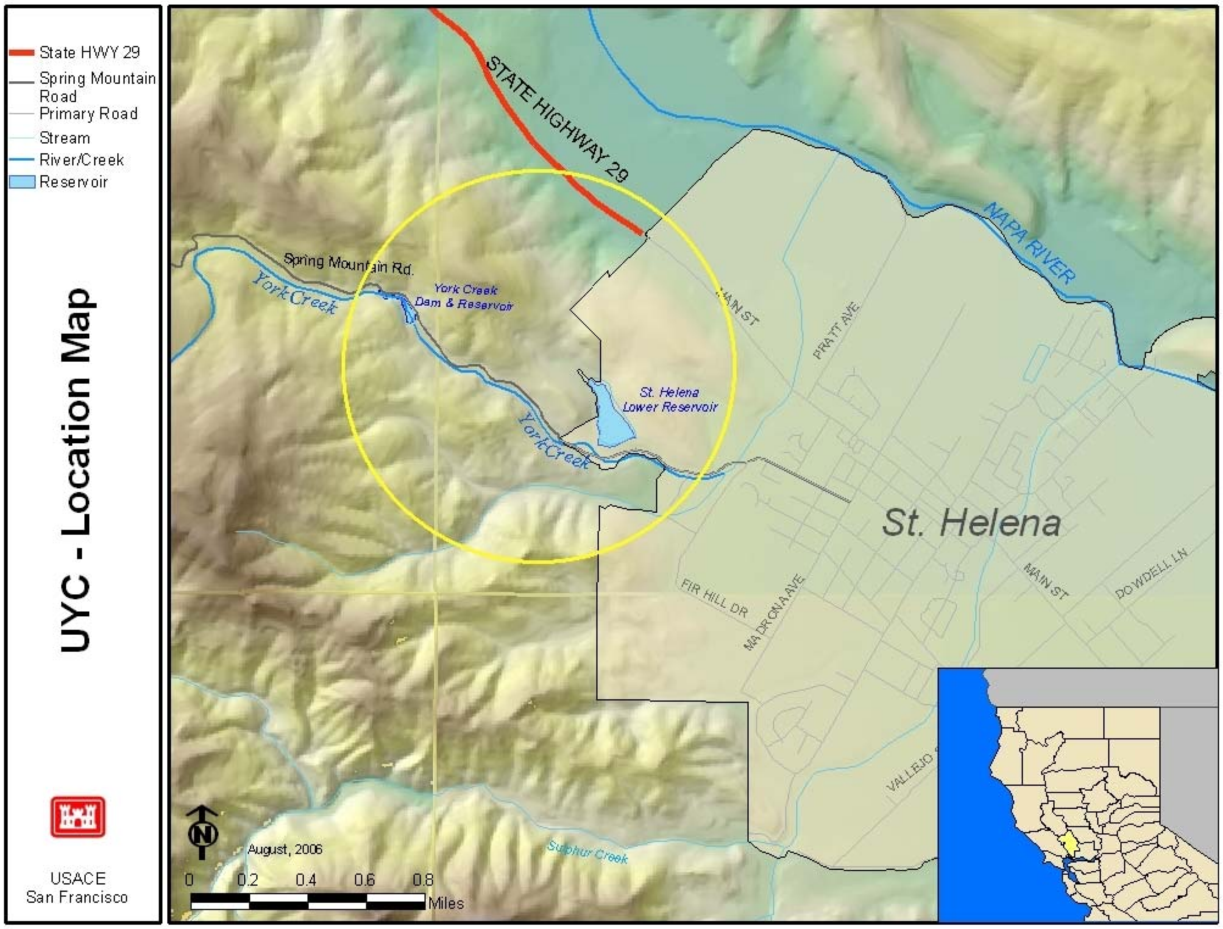

Figure 1: Project Location

A 2005 Salmonid Habitat Report by the Napa County Resource Conservation District (NCRCD) found that overall, York Creek is one of the most significant spawning and rearing streams for steelhead within the Napa Basin. Specifically, the upper reaches of York Creek offer excellent rearing and spawning habitat, and creating access to these areas would greatly benefit the overall steelhead population. York Creek has also been designated as critical habitat for threatened Central California Coast steelhead by the National Marine Fisheries Service (NMFS, 2000). Surveys by the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (DFG) have indicated that steelhead are abundant in York Creek below the York Creek Dam. Additionally, electrofishing efforts by Stillwater Sciences in 2005 determined that rainbow trout[1] are also present above the Upper York Creek Dam and Reservoir.

[1] **Rainbow trout**: Rainbow trout and steelhead are the same species of fish; the two names reflect two distinct life history patterns. The name rainbow trout is used for the non-anadromous life history. Rainbow trout do not leave the stream to go to the ocean. They spend their entire life in the stream. Anadromous forms of the trout can convert to resident populations when drought events or damming of rivers blocks their access to the ocean. Conversely, resident trout populations can become anadromous if ocean access becomes available (NCRCD, 2006). There is a rainbow trout population above Upper York Creek Dam.

Upper York Creek Dam has been identified as a significant obstacle to passage for steelhead in the threatened Central California Coast (CCC) Evolutionary Significant Unit. The removal or breeching of Upper York Creek Dam would open approximately 2 miles of suitable upstream habitat for steelhead.

PROJECT OBJECTIVES

The planning objectives are specified as follows:

- **OBJECTIVE: Improve fish passage.** To restore an aquatic corridor for all life stages of the federally listed steelhead *(Oncorhynchus mykiss)* and other aquatic based wildlife in the York Creek watershed and to reconnect and restore spawning, rearing, and migratory habitat for the steelhead and other aquatic wildlife from beneath the dam to approximately 2 miles upstream.

- **OBJECTIVE: Reduce future downstream habitat degradation and fish kills.** To reduce the risk of uncontrolled sediment releases that have been shown to cause fish and aquatic organism kills downstream of the dam and to restore a natural sediment transport system (fluvial process) through the project area.

- **OBJECTIVE: Habitat Restoration.** To restore approximately 3 total acres of degraded riparian and riverine habitat at and above Upper York Creek Dam.

- **OBJECTIVE: Connectivity.** To provide aquatic habitat connectivity for fish and aquatic wildlife species populations through the project site.

ALTERNATIVE PLANS

A preliminary and then a final array of alternatives were formulated to address identified problems and opportunities. Alternatives include measures to address fish passage, downstream sediment releases, habitat restoration, and aquatic habitat connectivity. The final alternatives are shown below in Table 1.

Table 1: Final Alternatives

Final Alternative	Description of Alternative
No-Action	No ecosystem restoration measures would be implemented.
Alternative 1: Complete Removal	Complete removal of dam and the right wall of the spillway. Complete removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.
Alternative 2B: Small Notch	Notch Dam: Minimize notch size to the minimum hydrologic passage of 23 feet due to slope stability constraints. 72% removal of dam and 95% removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.
Alternative 3: Fish Ladder	Modify (notch/lower) dam to existing streambed level above dam and construct fish ladder to this height. 37% removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.

All alternatives include various levels of accumulated sediment removal, dam material removal, and revegetation. The revegetation plan for all alternatives would be similar as all alternatives would require revegetation of approximately 2 acres of disturbed area. Table 2 lists the basic differences between the project alternatives including the differences in total width of the excavated channel, as well as the amount of dam and sediment material removed for each alternatives.

Table 2: Details of Project Alternatives.

Alternative	Width of Total Excavated Channel (ft)	Constructed Stream Width (ft)	Constructed Bench Width (ft)	Dam Material			Reservoir Material	
				Dam Material Removed (Cubic yards)	Percentage of Dam Removed	Removal of Spillway	Reservoir Material Removed (Cubic Yards)	Percentage of Accumulated Reservoir Material Removed
No Action	NA	NA	NA	NA	NA	NA	NA	NA
1	53	23	30	16,284	100%	Right Wall Removed	28,100	100%
2B	23	23	0	11,777	72%	No	26,637	95%
3	23	23	0	8,431	52%	No	10,372	37%

Below, Figure 2 is conceptual cross sections of each alternative as they would appear through the dam.

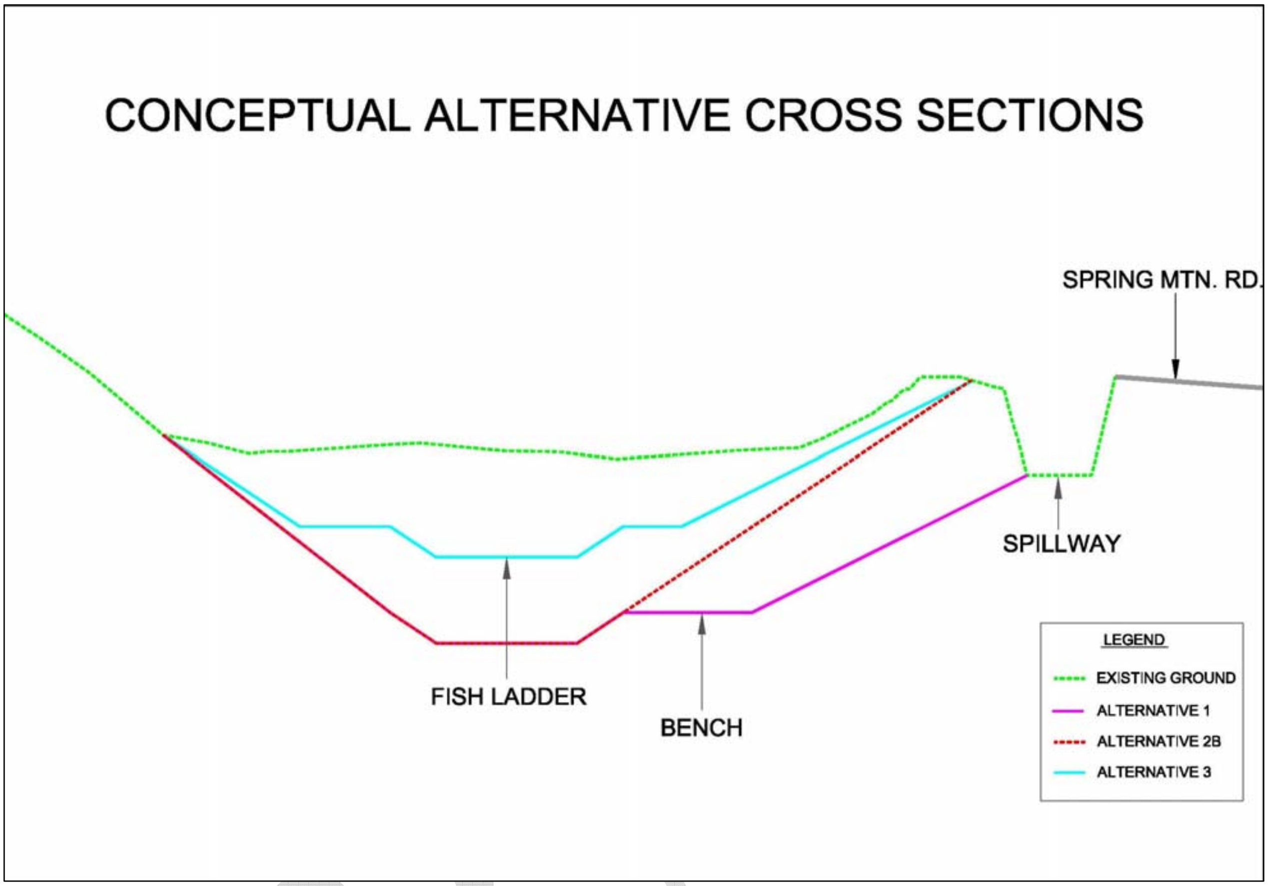

Figure 2: Conceptual Cross Sections of Final Alternatives

NO ACTION ALTERNATIVE

The No Action Alternative assumes that no ecosystem restoration measures are implemented. There would be no action taken to modify Upper York Creek Dam from its current configuration, there would be no removal of trapped sediments from behind the dam, and no fish passage would be restored to the upper reaches of York Creek.

ALTERNATIVE 1: COMPLETE REMOVAL OF DAM AND RIGHT WALL OF SPILLWAY

Alternative 1 is designed to be the most complete removal of the dam. The entire earthen dam would be removed and looking upstream, the right wall of the spillway would be removed. This would provide for a total channel width of 53 feet. Because the determined width for the restored creek is 23 feet, this alternative could have up to a 30 foot bench.

In general, Alternative 1 includes the following: removal of the entire earthen dam; (2) removal of all of the accumulated sediment from behind the dam; (3) construction and restoration of York Creek from just below the dam to just above the sediment basin with a slope of approximately 5%;

(4) revegetation of roughly 2 of aquatic and riparian habitat with native vegetation and; (5) use of native plants for erosion control and site stabilization.

ALTERNATIVE 2B: SMALL NOTCH

Conceptually, Alternative 2B was designed to remove the least amount of the dam and accumulated sediment while providing aquatic passage for the 1% storm event in order to maximize slope stability with the least amount of geotechnical stability measures. Alternative 2B would provide for a total channel width of 23 feet. Because the determined width for the restored creek is 23 feet, this alternative does not allow for a floodplain bench.

In general, Alternative 2B includes the following: (1) removal of approximately TBD% of the earthen dam structure; (2) backfilling the spillway with dam material for stabilization; (3) removal of approximately 95% of the accumulated sediment from behind the dam; (4) construction and restoration of York Creek from just below the dam to just above the sediment basin with a slope of approximately 5%; (5) restoration of roughly 3 total acres of aquatic and riparian habitat with native vegetation and; (6) use of native plants for erosion control and site stabilization.

Alternative 2B is the geotechnically favored alternative as this alternative appears to be the most stable of all alternatives.

ALTERNATIVE 3: FISH LADDER

Alternative 3 is designed to notch the dam as necessary to construct a concrete fish ladder through the notch and over the dam. The suggested fish ladder is a step-pool/weir design through the existing dam site.

In general, Alternative 3 includes the following: (1) notching the dam as necessary to construct a concrete fish ladder through the notch and over the dam; (2) removal of approximately 52% of the earthen dam structure; (3) backfilling the spillway with dam material for stabilization; (4) removal of approximately 37% of the accumulated sediment from behind the dam; (5) construction and restoration of York Creek from above the dam and fish latter upstream through the lowered sediment basin; (6) restoration of roughly 3 total acres of aquatic and riparian habitat with native vegetation and; (7) use of native plants for erosion control and site stabilization.

EVALUATION AND COMPARISON OF ALTERNATIVE PLANS

All of the action alternatives involve varying levels of dam modification, removal of dam material, removal of accumulated sediment material, revegetation of approximately 2 acres, and channel restoration. The final alternatives are differentiated by the portion of dam removed where Alternative 1 provides the greatest portion of dam removal, Alternative 2B provides for the removal of a “notch” through the dam, and Alternative 3 provides for the lowering of the dam and placement of a fish ladder over the remainder of the dam.

FISH PASSAGE:

Reestablishment of fish passage upstream of Upper York Creek Dam is also common to all the action alternatives, where Alternatives 1 and 2B provide for a restored natural creek bed and Alternative 3 provides for a fish ladder aquatic passage over the lowered dam. For comparison purposes, it is estimated that alternatives 1 and 2B would provide 100% effectiveness for upstream migrating steelhead whereas Alternative 3 would provide for 65-95% effectiveness.

FUTURE DOWNSTREAM HABITAT DEGRADATION AND FISH KILLS:

From the perspective of accumulated sediment and the future threat of sediment release, all action alternatives provide for sediment removal. Alternatives 1 and 2B provide for the removal of 95-100% of sediment and Alternative 3 provides for the removal of 37% of the sediment. The naturally restored creek for alternatives 1 and 2B also provide for the most natural sediment transport system in the future and thus eliminate the threat of an accidental accumulated sediment release. Alternative 3 reduces the threat of accidental sediment releases but does not eliminate it. Alternative 3 would leave 63% of the total accumulated sediment behind the lowered dam.

HABITAT RESTORATION:

All alternatives include the revegetation of roughly 2 acres of disturbed area. Revegetation would focus on creation of self-sustaining native vegetative habitat, control of erosion, and the stabilization of the newly created stream channel.

Riverine restoration in York Creek is most natural for Alternatives 1 and 2B. The primary difference between the action alternatives is that Alternatives 1 and 2B would be constructed, as feasible, to flow through the historical channel. Alternative 3 would be constructed from the top of the fish ladder (over the dam) and through the remaining sediment basin. For Alternative 3, the channel would be 10-12 feet above the original channel bed.

SLOPE STABILITY

Maintaining the stability of the adjoining Spring Mountain Road is considered as a project constraint that must be addressed adequately to achieve project success. To the extent possible in feasibility studies, slope stability concerns have been incorporated into the design of the recommended alternative and the Corps' PDT works closely with the City's geotechnical engineer to ensure that both parties are satisfied with the design and monitoring plans.

Feasibility level geotechnical analysis has determined that Alternative 2B is the preferred alternative for providing fish passage while maintaining a stable project site and protecting the Spring Mountain Road's stability. Alternative 1 requires the highest level of reinforcement measures for the long term structural stability. Alternative 3 is not expected to alter the level of stability from the No Action alternative.

SELECTION OF RECOMMENDED PLAN

The benefits associated with the alternatives have been calculated by combining current steelhead habitat availability with current trout population estimates. Together, this information allows for the calculation of the steelhead carrying capacity for Upper York Creek upstream of the dam. Table 3 summarizes the upstream ecosystem restoration benefits for the project alternatives.

Table 3: Ecosystem Restoration Benefits

Alternative	Upstream Ecosystem Benefit Units		
	Potential Steelhead Carrying Capacity	Percentage Effectiveness for Steelhead Passage	Total Ecosystem Benefits
No Action	1800	0%	0
1	1800	100%	1800
2B	1800	100%	1800
3	1800	65-95%	1205-1710

Below, Table 4 summarizes the benefits and costs for this project.

Table 4: Benefits and Costs (FY 2006 Price Levels)

Cost Items	**Alt 1**	**Alt 2B**	**Alt 3**
Benefits			
Ecosystem Benefits	1810	1810	1205-1710
LERRDs			
Land Acquisition	$167,000	$167,000	$167,000
Federal Administration costs	$93,500	$93,500	$93,500
LERRDs Subtotal	**$260,500**	**$260,500**	**$260,500**
Plans and Implementation Phase			
Geotech	$80,000	$80,000	$80,000
Water Resources	$100,000	$100,000	$100,000
Environmental Compliance	$50,000	$50,000	$50,000
Other	$20,000	$20,000	$20,000
P&I Phase Subtotal	**$250,000**	**$250,000**	**$250,000**
Construction Phase			
Construction	$5,686,238	$4,884,599	$4,055,384
Engineering During Construction	$150,000	$150,000	$150,000
Supervision & Administration	$350,000	$350,000	$350,000
Cultural Resources	$30,000	$30,000	$30,000
Construction Phase Subtotal (inc. LERRDs and P&I)	*$6,726,738*	*$5,925,099*	*$5,095,884*
Monitoring & Adaptive Management	$233,295	$208,266	$211,120
TOTAL FIRST COST	$6,960,033	$6,133,365	$5,307,004
Total Costs			
TOTAL FIRST COST	$6,960,033	$6,133,365	$5,307,004
Interest during construction	$447,788	$384,659	$319,959
TOTAL GROSS INVESTMENT	$7,407,821	$6,518,024	$5,626,963
Total Cost of Maintenance (OMRR&R)	$1,037,258	$1,037,258	$1,936,210
TOTAL COST	$8,445,079	$7,555,282	$7,563,173
Annual Costs			
Annual Costs of Total Gross Investment	$484,891	$435,205	$435,612
Annual Cost of Maintenance (OMRR&R)	$20,745	$20,745	$38,724
Total Annual Costs (AAC)	$505,636	$455,950	$474,336
Average Annual Cost per Ecosystem Benefit	**$268**	**$240**	**$265-$362**

NER PLAN

Alternative 2B is the National Ecosystem Restoration Plan as it is the most cost effective plan for the highest level of ecosystem restoration benefits. The Sponsor is supportive of the NER plan.

RECOMMENDED PLAN

Alternative 2B has been chosen as the recommended plan. The total first project cost is $6,133,365. The Recommended Plan is considered justified based on the significance of the non-monetary benefits as compared to average annual costs. The average annual cost per habitat unit is $240. The total acres of habitat created from this alternative is the sum (3.04 acres) of the restored riparian habitat (2 acres) plus the total acres of spawning habitat made available to steelhead (1.04 acres). The first cost per acre is $2,017,554
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LIST OF ACRONYMS

AAC	Total Annual Costs
BMP	Best Management Practices
CAP	Continuing Authorities Program
CCC	Central California Coast Steelhead
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQA	California Environmental Quality Act
City	City of Saint Helena
CFS	Cubic feet per second
Corps	U.S. Army Corps of Engineers, Civil Works, San Francisco District
Corps Regulatory	U.S. Army Corps of Engineers, Regulatory, San Francisco District
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRWQCB	California Regional Water Quality Control Board
CWA	Clean Water Act
DBH	Tree Diameter at Breast Height (4.5 feet above ground level)
DFG	Department of Fish and Game
DWR	California Department of Water Resources
EA	Environmental Assessment
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
HEC	U.S Army Corps of Engineer’s Hydrologic Engineering Center
HMS	Hydrologic Modeling System
HTW	Hazardous and Toxic Waste Assessment
ITSI	Innovative Technical Solutions, Inc
LER	Lands, Easements, and Rights-of-way
LERR	Lands, Easements, Rights-of-way, and relocations
LERRD	Lands, Easements, Rights-of-way, relocations, and dredged or excavated material disposal areas
NCRCD	Napa County Resource Conservation District
NEPA	National Environmental Quality Act
NPDES	National Pollution Discharge Elimination System
NMFS	U.S. National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
O&M	Operations and Maintenance
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and replacement
PDT	Project Delivery Team
PCA	Project Cooperation Agreement

RWQCB	California Regional Water Quality Control Board
SWPPP	Storm Water Pollution Prevention Plan
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDR	Waste Discharge Requirements
WRDA	Water Resources Development Act

LIST OF APPENDIXES

1.1 PURPOSE AND NEED FOR PROJECT AND REPORT

The U.S. Army Corps of Engineers, San Francisco District (Corps), and the City of St. Helena, California, the project's non-Federal sponsor, propose to remove or modify Upper York Creek Dam and appurtenances, remove accumulated sediment, and restore the local ecosystem structure in order to improve fish passage for the federally listed steelhead *(Oncorhynchus mykiss*), reduce the potential for future downstream sediment releases and fish kills, and restore approximately 3 acres of degraded riparian and riverine habitat surrounding Upper York Creek Dam to a more natural condition.

Upper York Creek Dam has been identified as a significant obstacle to passage for steelhead in the threatened Central California Coast (CCC) Evolutionary Significant Unit. Under the current conditions, York Creek is known to be one of most significant spawning and rearing streams for steelhead within the Napa River Watershed Basin for the CCC steelhead. The removal or breeching of Upper York Creek Dam would open approximately 2 miles of suitable upstream habitat for steelhead.

This detailed project report presents the results of studies for ecosystem restoration in the York Creek drainage basin northwest of the City of St. Helena, Napa County, and approximately 60 miles north of San Francisco.

1.2 STUDY AUTHORITY

This report was prepared as an interim/final response to the study authorization contained in Section 206 of the Water Resources Development Act (WRDA) of 1996 (Public Law 104-303), as amended, which reads as follows:

"(a) *The Secretary may carry out an aquatic ecosystem restoration and protection project if the Secretary determines that the project – (1) will improve the quality of the environment and is in the public interest; and (2) is cost-effective…*"

Section 206 of the 1996 WRDA is one of the nine legislative authorities under which the Corps of Engineers is authorized to plan, design, and construct certain types of water resource or system restoration projects that are of limited scope and complexity, without additional Congressional authorization. These authorities are called the Continuing Authorities Program (CAP) when referred to as a group. Section 206 specifically provides authority to undertake "aquatic ecosystem restoration and protection projects that (1) improve the quality of the environment, (2) are in the public interest, and (3) are cost effective." The Federal share of initial implementation costs for any single Section 206 project may not exceed $5 million.

Under the Section 206 study authority, the reconnaissance phase of the Upper York Creek study was initiated in December of 2001. The reconnaissance study showed that there was federal interest in continuing the study into the Corps' feasibility phase. The City of St. Helena, as the non-Federal sponsor, and the Corps initiated the feasibility study in October of 2002.

1.2.1 COST SHARING

Per Section 210 of the WRDA 1996, the non-Federal share of the implementation costs for ecosystem restoration projects would be 35 percent of the project or separable ecosystem element costs, unless project authorization specifies otherwise. The feasibility phase (and Design and Implementation Phase, if required) for a Section 206 study is initially Federally financed. Cost sharing initiates in the Construction phase and is completed at the closure of construction. During construction, the non-Federal sponsor is responsible for funding its share of the construction cost and its share of all previous planning and design costs (which was initially Federally financed). Post construction operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) is then the full responsibility of the non-Federal sponsor.

In most cases, the non-Federal sponsors shall provide 100 percent of the lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs), and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The value of LERRDS shall be included in the non-Federal 35 percent share. Where the LERRD exceeds the non-Federal sponsor's 35 percent share, the non-Federal sponsor would be reimbursed for the value of LERRD which exceeds their 35 percent share.

1.3 STUDY LOCATION

The project area is within the York Creek drainage basin, shown in Figure 1.1, and is located to the northwest of the City of St. Helena, Napa County approximately 60 miles north of San Francisco. The York Creek watershed is about 5 square miles and originates from the California Coast Range on the western side of the Napa Valley watershed at an elevation of approximately 1,800 ft. York Creek is a tributary to the Napa River, which flows to the Pacific Ocean via San Pablo Bay. The creek flows in an easterly direction through a narrow canyon before joining the Napa River northeast of the city of St. Helena in Napa County at an elevation of approximately 225 ft.

The upper and larger part of the watershed is located in unincorporated areas of the county; the lower and smaller portion of the basin lies within the city limits of St Helena. The watershed is sparsely populated mountainous terrain with most urbanization accruing downstream of the project site.

The project area includes the Upper St. Helena Dam and Reservoir on York Creek (Upper York Creek Dam and Upper Reservoir). The Upper York Creek Dam is an earthen dam that was built in 1900 and is located approximately 1.5 miles upstream of the City of St. Helena. The Upper Reservoir, though now abandoned as the result of siltation, was originally used for water storage.

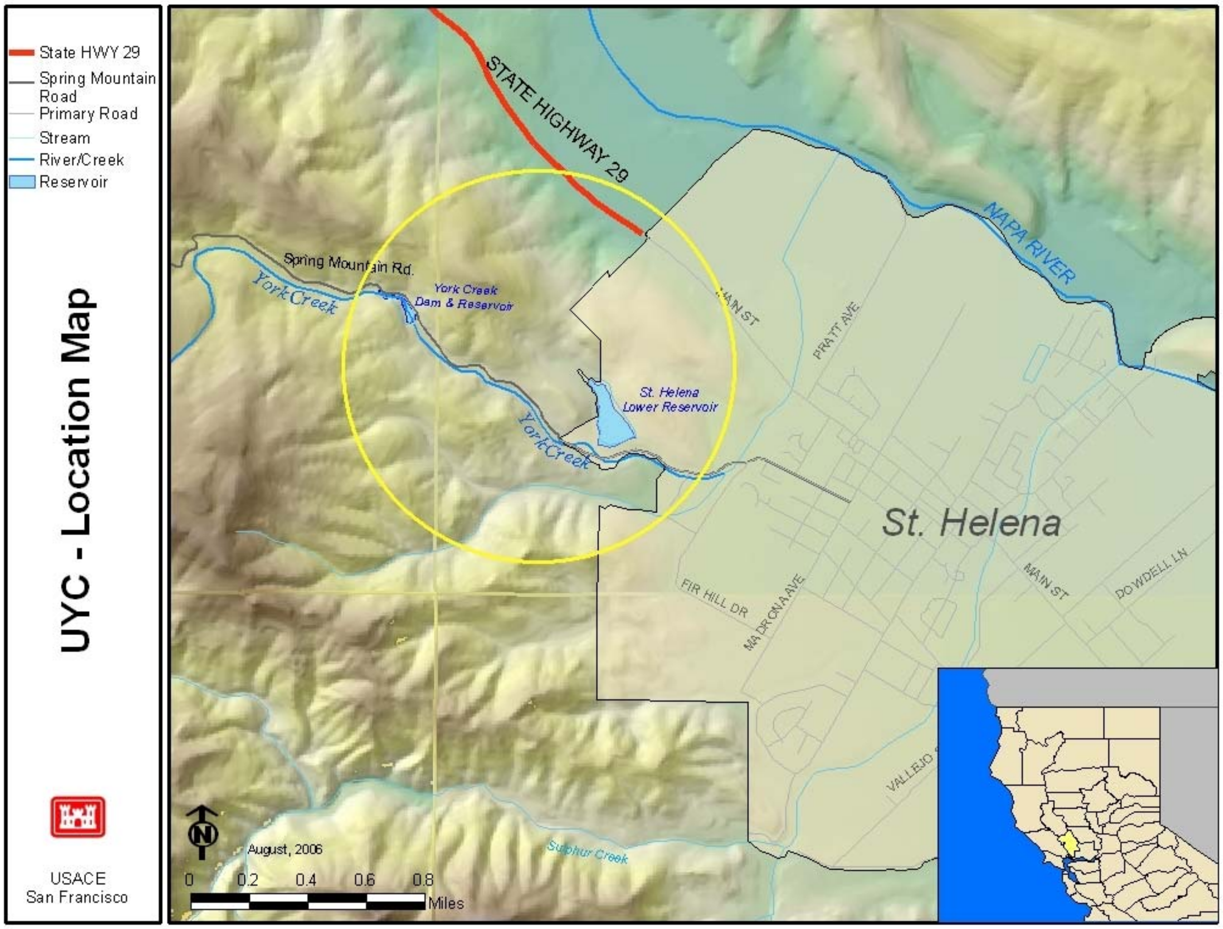

Figure 1.1. Project Location.

1.4 CONGRESSIONAL DISTRICTS

The Upper York Creek Basin is located in Napa County which is situated in the 1st Congressional District of California (Petaluma), Representative Mike Thompson.

1.5 STUDY SPONSOR AND PARTICIPANTS

The non-Federal sponsor for the feasibility phase of the Detailed Project Report (DPR) is the City of St. Helena. The US Army Corps of Engineers, San Francisco District, and the City of St. Helena jointly developed the ecosystem restoration plan presented in this report.

During the Feasibility Study, the staff from the City of St. Helena the agencies listed below participated in monthly team meetings with the study technical team. These agencies collaborated and contributed to the study effort throughout the study.

- U.S. Army Corps of Engineering Regulatory Branch (Corps Regulatory)
- California Department of Fish and Game (DFG)
- California Regional Water Quality Control Board (RWQCB)
- City of St. Helena (City)
- Department of Water Resources (DWR)
- Napa County District Attorney's office
- National Marine Fisheries Service (NMFS)
- United States Fish and Wildlife Service (USFWS)

1.6 HISTORY OF UPPER YORK CREEK DAM REMOVAL INVESTIGATIONS

On July 28, 1992, during routine maintenance of the reservoir outlet, there was an accidental sediment discharge downstream of the dam. This significant release resulted in a silt discharge "within the stream bed from the face of the dam to a point where the Napa River joins the stream" (DFG, July, 1992). The total distance of impact was approximately 2.5 to 3 miles long. The depth of the silt deposits varied from heavy deposits (up to 18 inches) just below the dam and continuing downstream for about 0.5 miles, gradually thinning until only a light covering of fine silt was deposited a the confluence with the Napa river (DFG, July 1992; DFG Aug 1992).

According to a DFG letter dated July 30, 1992, this sediment release was the fourth release since 1965. There have been accidental sediment releases in 1965, 1973, 1975, and 1992. In each incidence, "dense anaerobic sediments, high in toxic hydrogen sulfide, were released from the dam and deposited in pools and riffle areas downstream, quickly suffocating and burying all fish and aquatic invertebrates within a mile or more of the dam" (DFG, July 30, 1992).

After this discharge, DFG filed a complaint with the Napa County District Attorney. On September 30, 1992, DFG and the City agreed that the City should remove the existing earthen dam structure on Upper York Creek. The parties signed an agreement obligating the City to remove the dam, stabilize silt, remove silt that had filtered downstream, and take certain precautions to preserve the stability and natural character of the area.

In October 1993, the City applied for a Corps Regulatory Clean Water Act Section 404 permit to remove the dam. This application and a revised application in 1994 were determined to be incomplete. At the time of the initial 1993-1994 coordination with Corps Regulatory, steelhead in the CCC (Central California Coast ESU steelhead) were not yet listed pursuant to the Endangered Species Act (ESA), and the Corps was not obligated to initiate Section 7 consultation with NMFS. On August 18, 1997 a combinations of factors lead NMFS to list CCC steelhead as threatened, pursuant to the ESA. Loss of habitat and threats to their current range were cited as two leading factors.

In August 1998, and after the listing of steelhead, the City sent a letter to Corps Regulatory Branch, requesting that they reactivate the previous permit application for dam removal. This was request was declined and cited lack of adequate information to evaluate impacts to the aquatic environment from the project.

In October 2000, a letter was sent from NMFS law enforcement to the City Manager of St. Helena, with an attachment that provided clarification about the City's potential liabilities under the ESA if Upper York Creek Dam were to remain in place. In a letter dated November 21, 2000 the City's Attorney sent the NMFS, Corps Regulatory Branch, DFG, and the Napa County District Attorney's Office a letter explaining that it was the City Council's position "that Upper York Creek Dam should be at least be breached" to allow steelhead passage and "that the downstream diversion structure should be modified so that it is not a barrier or impediment to the passage of steelhead."

A meeting was held at the City's Offices on February 28, 2001 to discuss the project. Representatives from NMFS, the City, DWR, DFG, Corps' Regulatory and Planning branches, and the Napa County District Attorney's Office attended. At the meeting, representatives from DWR stated their intention to assist the City by providing planning and permitting services for the project to remove Upper York Creek Dam and modify the diversion structure. Because in-stream work and stream dewatering were identified as being necessary to correct the adverse effects on the listed species, NMFS advised that the project would likely require formal a Section 7 consultation.

In September 2001, DFG and the City successfully petitioned the Superior Court of Napa County to dismiss the case brought by DFG 1993 and void the Court's order in that case. An order of dismissal was entered by the Court on September 17, 2001. The earlier decision was declared null and void and DFG's claims were dismissed without prejudice. The judge's order included a stipulation that permits DFG to re-file their claim in court if necessary. St. Helena obligation to comply with the 1993 order of the court has indeed.

On November 28, 2001, a meeting was held at the City's Offices for DWR to give an update on the status of project planning and design. Representatives from NMFS, the City, DWR, DFG, Corps Civil Works and U.S. Fish and Wildlife Service attended. This meeting initiated the Corps' Civil Works ecosystem restoration project.

Today, the dam continues to block aquatic fish passage and sediment has led to further degradation behind the dam. In 2004, the City and DWR completed a "Fish Passage Improvement Project" that removed the only other fish passage barrier on York Creek. The diversion structure was .5 miles below Upper York Creek Dam. It was a 5 feet high concrete masonry diversion structure that diverted water from York Creek to the Lower Reservoir. The modifications involved removal of the concrete structure, creation of cascading steps with resting pools, bank stabilization, and native plant generation. The project has opened .5 miles of habitat and improved stream function and fish passage upstream to the York Creek Dam.

Currently, the City is working with the Corps to remove the second fish passage barrier on York Creek: the Upper York Creek Dam. Until the dam is removed, and to prevent a sudden release of sediment, the City has committed to periodical removal of excess sediment from behind the dam. They are currently planning to remove sediment in September-October 2006.

1.7 EXISTING STUDIES

DWR prepared several reports and analyses in 2001-2002 for removing the dam. These reports are included in the following section. Generally, the DWR reports provided baseline studies and planning efforts for the removal of the dam. Reports included biological baseline reports, hydrologic and hydraulic baseline reports, as well as several planning documents. The Corps has utilized these reports to the maximum extent possible to avoid duplicate efforts

- California Department of Water Resources (DWR). August 2001*. Sediment Sampling and Analysis of Upper York Creek dam and Upper Reservoir Site Integrated Storage Investigation (ISI).* This analysis was done for determining whether specific contaminants, namely heavy metals and organochlorine pesticides, are present in the sediment at concentrations that exceed existing regulatory threshold limits. None of the composite sediment and background soil samples collected at the project site exceeded existing Total Threshold Limit Concentration (TTLC) values for each of the requested contaminants.
- DWR. October 2001. *California Red-Legged Frog Field Survey Results and California Freshwater Shrimp Habitat Assessment*. This report contains results of red-legged frog field surveys for Upper Reservoir, York Creek in the vicinity of Upper York Creek Dam and the downstream masonry diversion structure on York Creek.

- DWR. March 2002. *Revegetation and Monitoring Plan for the Upper York Creek Dam Removal and Stream Restoration Project*. This document provided revegetation and monitoring plans for the Upper York Creek Dam Removal Project and was used as baseline information while developing the Corp's 2006 Revegetation Report.

- DWR. April 2002. *York Creek Sediment Transport Analysis.*

- DWR. July 2002. *York Creek Dam Removal – Hydraulic Analysis*. Erika Kegel.

- DWR. November 2002. *Initial Study for the York Creek Diversion Modification Project*, The purpose of this study was to determine whether the proposed diversion project would result in any potentially significant impacts to the environment pursuant to California Environmental Quality Act (CEQA). It provides watershed baseline information for the dam removal project.

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2.1 STUDY AREA DESCRIPTION

2.1.1 NAPA RIVER WATERSHED

The Napa River watershed covers approximately 426 square miles, and is contained by mountains to the north, west, and east. The watershed is typical of the California coastal range with northwest-southeast trending topography. The Napa River runs through the center of the watershed on the valley floor. It drains 48 major tributaries and numerous smaller ephemeral streams on its 55 mile path from the headwaters of Mt. St. Helena in the Mayacamas Mountain range to the San Pablo Bay. Along this route the river winds through varied landscapes of forested mountain slopes, vineyards, urban areas, open pasture, industrial zones, grasslands, marshes, and brackish estuary (NCRCD, 2005).

The Napa River basin is known to contain 27 species of freshwater fish, 14 of which are native and 13 are exotic species that have been intentionally or accidentally introduced (Stillwater Sciences, 2002; Moyle, 2002). Historically, the basin likely supported three salmonid species: chinook salmon, steelhead, and coho salmon; coho salmon are considered extirpated within the basin. Chinook salmon have been sporadically reported in the Napa River since the 1980's; however no data on run size, timing, or origin have been collected (Pers. comm. J. Emig, 2000). In 2003 and 2004, significant numbers of fall-run chinook salmon were documented in the Napa River and several tributaries (NCRCD, 2005)

In terms of population size and geographic distribution, steelhead are the most significant salmonid species within the watershed. Napa River steelhead populations have been greatly reduced from historical levels. It is estimated that the Napa River watershed supported a population of approximately 8,000 adult steelhead as recently as 100 years ago. The current steelhead population is unknown due to a lack of quantitative data. Recent basin wide surveys estimate the population to be between 200 and 1,000 adult steelhead (Stillwater Sciences, 2002; EcoTrust, 2001). NOAA Fisheries listed steelhead as a threatened species in Napa County in August 1997. Spawning adult steelhead are still documented each year by landowners and agencies, and most tributaries to the Napa River appear to be well seeded with juveniles (EcoTrust, 2001). Despite reduced populations, the Napa River watershed is considered one of the most significant anadromous fish streams within San Francisco Bay (Leidy et al., 2005) (NCRCD, 2005).

2.1.2 YORK CREEK WATERSHED

The Upper York Creek Ecosystem Restoration Project is within the five-square-mile York Creek drainage basin and is located northwest of the city of St. Helena, Napa County, 60 miles north of San Francisco (See Figure 1.1). Figure 2.1 shows York Creek approximately 700 feet upstream of Upper York Creek Dam.

Figure 2.1 York Creek Natural Condition (Approximately 700 feet upstream of Dam).

The upper and larger part of the watershed is located in unincorporated areas of the county while the lower and smaller portion of the basin lie within the city limits of St. Helena. The watershed is sparsely populated mountainous terrain with urbanization accruing downstream of the existing dam area. The watershed is almost entirely privately owned, and vehicle access exists via Highway 29 (Main Street), and Spring Mountain Road in St. Helena. (NCRCD, 2005)

York Creek is a tributary to the Napa River, which flows to the Pacific Ocean via San Pablo Bay. York Creek drains a watershed of approximately 4.4 square miles, originating in the California Coastal Range on the western side of the Napa Valley watershed and ending at the confluence with the Napa River northeast of St. Helena. Elevations range from about 220 feet at the confluence with the Napa River to 2,160 feet in the headwater areas.

Redwoods and mixed conifer forest dominate the riparian corridors in the upper watershed. Mixed hardwood forest and vineyards cover much of the remaining watershed with urban and built up areas in the lower reaches.

Approximately 2.5 miles (4.0 km) upstream from it's confluence with the Napa River, a concrete masonry structure diverts water from York Creek to the City's Lower York Creek Reservoir (Lower Reservoir). The Lower Reservoir, located on an unnamed tributary to York Creek, supplies water for irrigation and other municipal uses and has a capacity of approximately 200 acre-feet.

2.1.3 PROJECT SITE

The 2.1-acre project site is located at Upper York Creek Dam (St. Helena Upper Dam) and Upper Reservoir in York Creek Canyon, approximately 1.25 miles northwest of the city of St. Helena. At an elevation of 570 feet, the earthen dam was completed in 1900 and is composed of approximately 12,670 cubic feet of material that came from soil excavated on site to create the three-acre Upper Reservoir. The 50-foot-high, 140-foot-long structure once impounded water to form the reservoir, which had a 10-million-gallon storage capacity and was used for municipal water supply. Today, use of the reservoir has been abandoned as it has essentially no capacity due to sedimentation.

Both sides of the dam are faced with basaltic fieldstone riprap. A six-foot-diameter steel intake pipe is located immediately behind the upstream side of the dam and extends vertically down 26 feet to a stone culvert. This culvert is 175 feet long and 3 feet in diameter, and leads to an outlet at the base of the dam's downstream side. The dam features two concrete spillways, one built simultaneously with the dam, and the other constructed in 1933. The original spillway is located on the south side of the dam, whereas the second and larger side channel concrete spillway is located adjacent and parallel to Spring Mountain Road.

Below, Figure 2.2 is a conceptual diagram of the project location. Upper York Creek Dam, Upper York Creek Reservoir, the spillway, and Spring Mountain road are shown.

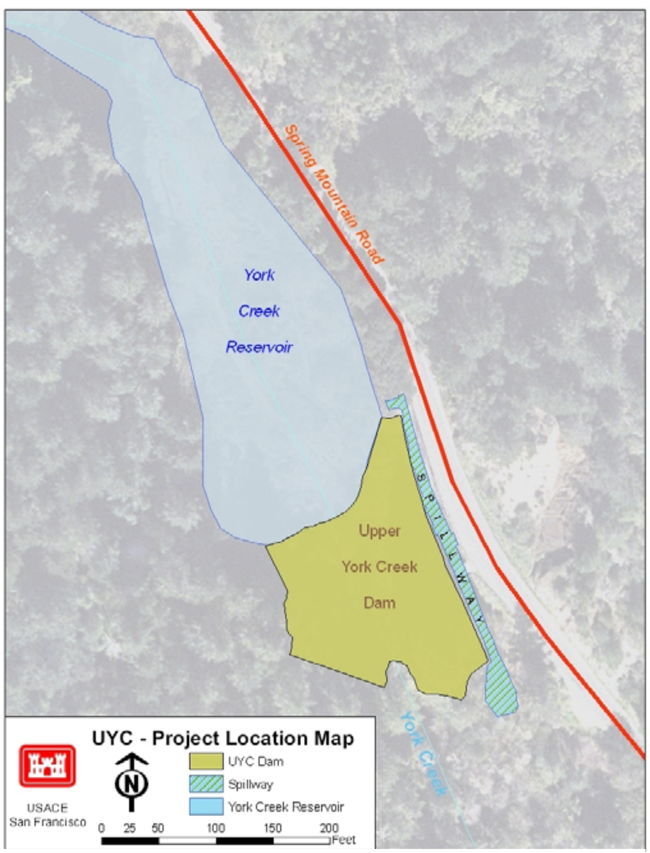

Figure 2.2 Conceptual Diagram of the Project Site.

The below figures are photographs of the reservoir and spillway in dry and storm conditions.

Figure 2.3 Upper Reservoir in dry conditions (November 17, 2005)

Figure 2.4 Upper Reservoir in Storm Conditions. (January 1, 2006)

Figure 2.5 Spillway in dry conditions (November 17, 2005)

Figure 2.6 Spillway in Storm Conditions. (January 1, 2006)

2.2 HISTORICAL WATERSHED USE

2.2.1 COMMUNITY DEVELOPMENT

Settlement of Napa County began as early as 1822, when the area was governed by Mexico. Between then and the Treaty of Guadalupe Hidalgo, which ceded the land to the United States, Americans were granted tracts of land by the Mexican Government in the area. In 1851, 828 acres were organized into Napa County. The Northern half of the county was cut in 1861 and incorporated as part of Lake County. Napa County is now 450,000 acres containing three valleys parallel with the Pacific Coast.

The many opportunities available in the area, as well as the mild climate, drew many immigrants to the area, with the Napa River allowing supplies to be brought in from San Francisco. By 1850, the first steamer was running between Napa City and San Francisco. By the 1870's the county was maintaining a graveled road from Napa City as far as St. Helena. The Napa Valley Railroad Company, Chartered in 1864, had lines running as far as Calistoga by 1867.

With Napa City at the south end of the valley, the town of St. Helena grew up along the road to Calistoga. Community development was initially propelled by raising livestock, but improvements in agricultural production in the 1880's motivated landowners to subdivide and sell to agriculturists. Wheat and barley grew well in the area, as did grapes. In the mid-19th century, St. Helena became known as the "vineyard district" of Napa County.

2.2.2 WATER USAGE

The town of St. Helena, in Napa County, was established in 1876. The major economic activity in the area was winemaking. The water used for the town and the wineries was from wells tapping into the aquifer that flowed beneath the center of St. Helena. Landowners along creeks and springs also retained water rights to sustain their agricultural operations.

Recognizing the need to conserve and share water, a number of local residents assigned their water rights and portions of their land along Hudson's Creek, later renamed York Creek, to David Fulton in 1869. Their purpose was to construct a small reservoir to contain the creek which was done in April 1871. Another local resident, John York, eventually leased his rights to Fulton as well, including the flume that he had built upstream of the reservoir to irrigate his property.

In July of 1877, a group of local wine growers along York Creek filed articles of incorporation as the St. Helena Water Company, organized to supply the town of St. Helena with fresh water. The early members of the company, who all owned land along the creek, deeded portions of that land to the company. In May of 1878 construction began on a dam that would contain a 10 acre reservoir. The dam was 223 feet long, 55 feet high and 21 feet wide at the crest. Pipe was laid from the reservoir to the town and St. Helena became the first town in Napa County to have city water.

In 1882, the St. Helena Water Company met the increasing water needs of the community with improvements to the dam and reservoir. That year, they widened the base and strengthened the dam so they could raise the height 20 feet. The following year, they raised the height another 10 feet and lengthened the dam by 150 yards. To meet the ever increasing needs of the community, the St. Helena Water Company built the Upper Dam and Reservoir (project site) in 1900.

When completed in 1900, the Upper Reservoir on York Creek covered three acres and had a 10,000,000 gallon storage capacity. The earthen filled dam was 50-feet high and 140-feet long on the crest. Both faces were covered with riprap stone, and there was a culvert and 6-inch draw-off pipe through the center of the dam, with a sluice gate and screw gear for regulating the discharge from the reservoir. In 1933, a concrete spillway was built alongside the dam with a wooden flume that carried overflow into the creek.

A diversion structure was built a little over one-half mile below the Upper Reservoir, consisting of a smaller dam of rubble stone masonry that was capped with concrete. The structure diverted water restrained by the little dam into a pipeline that ran underground for 1,609 feet to the Lower Reservoir. Here it emptied into a large 30,000 gallon redwood tank. The redwood tank connected directly to the main pipes leading into town and excess water flowed into the Lower Reservoir (Eastman 2003; Hoar 1922).

The City of St. Helena purchased all lands owned by the St. Helena Water Company in 1922, including the dam, Upper and Lower Reservoirs, rights-of-way and conduits. Now having its own municipal water utility, St. Helena's water collection, and storage facilities were more than adequate to serve their needs for some time into the future.

The Upper Reservoir Dam has not been reconstructed or altered in a major way since initial construction in 1900. A concrete spillway was added to the structure in 1933 to handle large flows through the project site. Today, the dam no longer is used for water storage as the reservoir is completely filled with sediment from upstream sources.

The future without-project conditions for water usage are expected to remain relatively unchanged for the foreseeable future.

2.3 HYDROLOGIC, HYDRAULIC, AND SEDIMENT TRANSPORT

2.3.1 HYDROLOGY

The headwaters of York Creek originate in the California Coast Range. It flows in an easterly direction, paralleling Spring Mountain Road, through a narrow canyon before joining the Napa River northeast of St. Helena. The origin of the creek is at an elevation of approximately 2,200 feet and it drops to an elevation of approximately 225 feet at its confluence with the Napa River. The drainage basin upstream of the dam covers 2.48 square miles. The basin area above the Napa River and York Creek confluence covers 5.0 square miles. The average rainfall is 35 to 40 inches per year for York Creek

The Corps' Hydrologic Engineering Center's (HEC) Hydrologic Modeling System (HMS) computer program was used to develop event discharges. The software was used to model the precipitation-runoff process in the watershed and obtain peak flow rates. The peak flow rates were checked against a model done by the DWR Technical Release 55 (TR-55).

There are no flow gages on York Creek. To compensate for this, mean daily flow records were obtained from nearby Nevada Creek, Adams Creek, Sulphur Creek, Dry Creek, and Santa Rosa Creek. Based on the above data, mean daily discharges were developed for York Creek. The flow duration curves would be used for fish ladder and low flow analysis.

The without-project conditions for hydrology are expected to remain relatively unchanged for the foreseeable future.

2.3.2 HYDRAULICS

Both existing and with project conditions were evaluated using the Corps' HEC River Analysis System (RAS) computer model. HEC-RAS models were used to determine channel velocities and water surface elevations. For existing conditions, channel velocities would range from 5 to 14.5 feet per second (fps) during a 1% event discharge. Channel velocities under project conditions would average 13 fps.

The without-project conditions for hydraulics are expected to remain relatively unchanged for the foreseeable future.

2.3.3 GEOMORPHOLOGY

York Creek is in reasonably good condition from a geomorphic perspective upstream and downstream from the dam site. Pools, riffles, meanders, and gravel bars are typical of streams that have been subject to limited human impacts. History of sediment removal from the site and recent history indicate that gravel supply for any restoration project is adequate.

The without-project conditions for geomorphology are expected to remain relatively unchanged for the foreseeable future.

2.3.4 SEDIMENT TRANSPORT AND DOWNSTREAM FLOODING

Under existing conditions, sediment transport capacity is highest in the steep sloped canyon reaches. Sediment transport capacity is lost as York Creek enters the Napa Valley, where the land is less steep and has less capacity to move sediment in the downstream direction. It is estimated that approximately 28,100 cubic yards of accumulated sediment is trapped behind the dam.

The existing dam traps almost the entire bed load and some of the suspended sediment from traveling to the lower portions of the watershed. These sediments range in size from fines to small boulders. Since the construction of the dam, it has captured an estimated 1,000 to 1,500 cubic yards of sediment per year. During high rainfall years (2005-2006) as much as 5,000-10,000 cubic yards of sediment can be deposited behind the dam (USACE, 2006). Likely sources of this sediment include the streambed, unnamed tributaries flowing into York Creek, runoff from viticulture areas and sediment from landslide activities.

Under existing conditions, there have been flood events along the lower portions of York Creek, where the Creek flows across the Napa Valley. In this area, York Creek is mostly channelized and does not have enough channel capacity to handle large storm events. The most recent event was during the New Year's Storm of 2005-2006. During this storm, York Creek exceeded channel capacity and flooded a Beringer Winery warehouse parking lot, vineyards, and the Culinary Institute's dorms.

Without project conditions would include the continued accumulation of sediment in the Upper Reservoir as well as continued flood events in the lower reaches of York Creek. The City is expected to occasionally remove portions of the accumulated sediment to prevent downstream releases. The City has also committed to establishing a baseline condition for sediment transport, hydrological, and flooding conditions for York Creek downstream of the project site. The City has assumed the responsibility for this need and is working to evaluate pre-project baseline conditions.

2.4 GEOTECHNICAL SITE CONDITIONS

2.4.1 GEOTECHNICAL AND GEOLOGIC CONDITIONS

Upper York Creek lies within the Coastal Range geomorphic province of California. The area is a heterogeneous mixture of intrusive, extrusive, metamorphic, and sedimentary rock. Perlitic ryholite, Serpentine, sheared shale and sandstone, a landslide and a fault are all mapped in the vicinity of the project site.

The project site generally includes a 50-foot high earthen dam, a concrete spillway and the sediments, ranging in thickness between 17 and 29 feet, that have accumulated upstream of the dam in what was once a water supply reservoir. The dam itself is built with fill consisting of sandy silt, silty sand and clayey sand mixed with gravel and cobbles overlaying serpentine bedrock. The sediment built up behind the dam is sandy silt (with clay) overlaying sand and gravel with bedrock as much as 29 feet below the surface. Downstream of the dam is serpentine bedrock which exhibited greatly varying degrees of strength when tested.

Explorations performed by Treadwell and Rollo indicate the road/pavement section at the dam is underlain by fill and then serpentinite at relatively shallow depths. The concrete spillway and left abutment of the dam are also underlain by serpentinite. The existing highway cut in the tuft is standing at about a 0.4 Horizontal (H) to 0.5 H to 1 Vertical (V) slope. The existing highway cut in the serpentine is about a 0.6 to 0.7 H to 1V slope.

The future without-project conditions for geotechnical and geologic conditions are expected to remain relatively unchanged for the foreseeable future

2.4.2 PROJECT SITE SLOPE STABILITY

There is an observed ground movement in the project area. It is bounded by the hillside to the east, Spring Mountain Road in the middle portion and the spillway and the dam towards to the west. The exact reason for the movement is unknown.

It is believed the dam provides limited lateral support to the spillway and Spring Mountain Road, which in turn tends to minimize ground movement in the area. Geotechnical slope stability analysis and deformation was performed and is described in the Geotechnical Appendix as well as in section 5.1.1.1 Environmental Consequences of the Proposes Action: Topography, Geology, and Soils of this report.

The future without-project conditions for project site slope stability are expected to remain relatively unchanged for the foreseeable future.

Figure 2.7 Spring Mountain Road Facing Upstream. (Spillway located to left of road).

2.5 ENVIRONMENTAL CONDITIONS

2.5.1 BIOLOGICAL RESOURCES

2.5.1.1 Riparian Wildlife

The forest in the vicinity of the project sites provides habitat for numerous wildlife species typical of the California Coast Ranges. Common mammals include black-tailed deer, coyote, bobcat, raccoon, and skunks. Birds include a variety of raptors and songbirds. During site visits to the Lower Diversion Structure Restoration Project, which is located downstream of York Creek Dam, DWR biologists observed red-tailed hawk, Cooper's hawks, turkey vultures, and juvenile great horned owls, among other bird species, in the vicinity of the Upper Reservoir.

The relatively cool, moist forest surrounding York Creek Dam and Upper Reservoir also provides suitable habitat for banana slugs, observed during several site visits, and Pacific giant salamanders, indicated by the observation of one dead adult in York Creek, upstream from the Upper Reservoir, on November 19, 2001. The Upper Reservoir and a scour hole at the base of the York Creek Dam spillway contain numerous non-native bullfrogs. The signal crayfish is another non-native predator observed throughout York Creek and in the Upper Reservoir (ENTRIX 2002).

The future without-project conditions for riparian wildlife are expected to remain relatively unchanged for the foreseeable future.

2.5.1.2 Birds

There are several bird species that are "State Species of Special Concern" or "Federal Species of Concern" that have potential to occur in the vicinity of York Creek and the project site. Of these species only one of these has been noted during surveys or site visits. According to a 2002 DWR report, there is, or has been, a nesting pair of northern spotted owls about one mile upstream of the project area. The project site is located within the 1.3 mile radius that the California Department of Forestry considers to be the limit of their foraging area. However, project activities will occur at least 1 to 1.5 miles away, and, therefore, will not cause disturbance.

The future without-project conditions for birds are expected to remain relatively unchanged for the foreseeable future.

2.5.1.3 Fisheries

The Napa River basin is known to contain 27 species of freshwater fish, 14 of which are native and 13 are exotic species that have been intentionally or accidentally introduced (Stillwater Sciences, 2002; Moyle, 2002). Historically, the basin likely supported three salmonid species: chinook salmon, steelhead, and coho salmon; coho salmon are considered extirpated within the basin. Chinook salmon have been sporadically reported in the Napa River since the 1980's; however no data on run size, timing, or origin have been collected (Pers. comm. J. Emig, 2000).

York Creek contains high quality spawning and rearing habitat and has been designated as critical habitat for threatened CCC steelhead. Surveys by the NMFS and the DFG indicate that steelhead are abundant in York Creek below the York Creek Dam. The steelhead occurring in the two miles of suitable habitat above York Creek Dam are considered a resident population of rainbow trout that could be related to steelhead in the drainage.

A 2005 Salmonid Habitat Report by the Napa County Resource Conservation District (NCRCD) found that overall, York Creek is one of the most significant spawning and rearing streams for steelhead within the Napa Basin. Specifically, the upper reaches of York Creek offer excellent rearing and spawning habitat, and creating access to these areas would greatly benefit the overall steelhead population.

The future without-project conditions for fisheries are expected to remain relatively unchanged for the foreseeable future.

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2.5.1.4 Vegetation

Upper York Creek Dam, and sediment reservoir has compromised the riparian and aquatic habitat in the project area for over 100 years. Riparian habitats immediately upstream and downstream of the project are comprised of lush riparian habitat whereas the project site riparian habitat is limited. Opportunistic riparian plants have established on the gravel bars, but many of these were washed away in a major 2005-2006 winter storm event. During the summer months, when construction will occur, summer flows meander across the top of the gravel to the drop snorkel outfall. Below is a description of the vegetation at or near the project site in May 2006. At the time of the assessment, the entire area was inundated due to recent rain events.

The habitat surrounding the project site dense to sparsely vegetated riparian and forested woodlands. The canopy is dominated by oaks, bigleaf maple, California bay, Douglas fir, willow, and white alder. The understory is sparsely to heavily vegetated. The downstream embankment is dominated by Himalaya blackberry, unidentifiable oak saplings, scotch broom, coyote brush, periwinkle, and fennel. Several medium size (6 – 8”dbh) willows and white alder occur within the sediment basin. There are a few isolated patches of emergent vegetation present, especially along the right bank. These include mostly Himalaya blackberry, willow, and white alder. Giant horsetail occurs along the edge of the impoundment in a few locations.

The future without-project conditions for the vegetation are expected to remain relatively unchanged for the foreseeable future.

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2.5.2 CULTURAL RESOURCES

The proposed project area involves one of two components of a “historic property,” the York Creek Upper Reservoir Dam and Lower Diversion Structure.

These two historical resources were evaluated by an architectural historian contracted by the City of St. Helena, who determined they were eligible for listing in the National Register under Criterion A: “The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association and that are associated with events that have made a significant contribution to the broad patterns of out history”. These findings were documented in the Historical Resources Evaluation Report for the Proposed Removal of an Earthen Dam and Diversion Structure on York Creek near the City of St. Helena in Napa County, California, Bright Eastman, Anthropological Studies Center, and Sonoma State University.

Subsequent Section 106 (National Historic Preservation Act) consultation between the San Francisco District and the State Historic Preservation Officer (SHPO) confirmed the property’s eligibility, qualifying under Criterion A at the local level of significance under the theme of community planning and development. These two major engineering features of St. Helena’s water-supply system were important parts of the town's infrastructure during the early 20th century, and essential for the growth and development because they eventually provided water service to a large number of new commercial and residential properties that were being built and assured more reliable water for fire protection.

The future without-project conditions for cultural resources are expected to remain relatively unchanged for the foreseeable future.

2.5.3 HAZARDOUS WASTE BASELINE

Innovative Technical Solutions, Inc. (ITSI) conducted a soil assessment for hazardous and toxic waste at the Upper York Creek Dam, Spring Mountain Road, St. Helena, California in December 2003. They conducted tests of both the soil used in the earthen dam and in the sediment built up in the Upper Reservoir behind the dam. All the material was tested for polynuclear aromatic hydrocarbons (PAHs), organochlorine pesticides, metals, and asbestos.

According this assessment, there are no areas in the project area that require remediation prior to construction. Asbestos was found in samples of the earthen dam and sediment bed that would necessitate the adoption of best management construction practices (BMPs). This is further described in Chapter 4: Recommended Plan.

The assessment found that reuse of materials from the earthen dam for surfacing applications, e.g., roads, parking lots, near-surface filling (less than six inches deep), or use in concrete or mortar, would be prohibited. Based on low asbestos concentrations in samples of the sediment bed, the sediments require further testing prior to reuse for in surfacing applications.

The future without-project conditions for hazardous waste are expected to remain relatively unchanged for the foreseeable future.

3.1 PLAN FORMULATION AND METHODOLOGY

The Corps' planning process is a two-tiered process consisting of a *reconnaissance phase* and a *feasibility phase*. Both phases are used to evaluate the project's economic and environmental viability and optimization. The primary purpose of the reconnaissance phase is to determine whether there is potential Federal interest in any proposed project alternatives and to identify a non-Federal sponsor. If a potential Federal interest is identified in the *reconnaissance phase*, further formulation, evaluation, and comparison of alternatives is performed in the *feasibility phase*, resulting in the selection of a recommended alternative.

For the Upper York Creek Ecosystem Restoration Project, the Corps completed the reconnaissance phase with findings documented in the March 2002 Preliminary Restoration Plan (PRP). The findings from the reconnaissance phase indicated a potential Federal interest and recommended several alternatives for further evaluation in the feasibility phase.

Discussed together, the reconnaissance phase and a feasibility phase make up the Corps' Planning Process. This planning process is described in the 6 steps listed below:

1) Specification of water and related land resource problems and opportunities (relevant to the planning setting) associated with the Federal objective and State and local concerns.
2) Inventory, forecast and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities.
3) Formulation of alternative plans
4) Evaluation of the effects of the alternative plans
5) Comparison of alternative plans
6) Selection of the recommended plan based upon the comparison of alternative plans.

The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the Corps' planning process. These steps are often referred to collectively as *Plan Formulation*. Plan Formulation is a highly iterative process that involves cycling through the formulation, evaluation, and comparison steps many times to develop a reasonable range of alternative plans and then narrow those plans down to a final array of feasible plans from which a single plan can be identified for implementation.

To facilitate the plan formulation process, the methodology outlined in the Corps' Engineering Regulation 1105-2-100, "Planning Guidance Notebook," 22 April 2000, was used. This process is summarized below:

1) Formulate and screen management measures (referred to hereafter simply as measures) to achieve planning objectives and avoid planning constraints. Measures are the building blocks of alternative plans.
2) Formulate, evaluate, and compare an array of alternative plans to achieve ecosystem restoration.
3) Identify a feasible plan that reasonably maximizes net National Ecosystem Restoration (NER) outputs (outputs minus costs). The plan that reasonably maximizes NER is called the NER plan.

When the tentatively recommended alternative has been confirmed, the study would proceed to develop more detailed design and cost estimates for that plan, which would be presented in the Draft Detailed Project Report. An accompanying Draft Environmental Assessment (EA) would provide a detailed discussion of the environmental analysis for the recommended alternative.

Table 3.1. Current Project Schedule

Milestones	Schedule
Complete Draft Report	August 2006
Public Review	September 2006
Final Report	October 2006
Division Engineer Notice	October 2006
Execute Cost-Sharing Agreement PCA	November 2006
Complete Design and Implementation	March 2007
Complete Real Estate Acquisition	Dec 2006
Advertise Construction	May 2007
Construction Start	June 2007
Complete Construction	October 2008
Turnover Project to Local Sponsor	October 2008
Initiate Monitoring and Adaptive Management	March 2007
Complete Monitoring and Adaptive Management	August 2010

3.2 PLANNING CRITERIA

Planning criteria are used to formulate, screen, evaluate, and compare measures and alternative plans. Four specific screening criteria are required in Corps water resource studies: completeness, effectiveness, efficiency, and acceptability. These criteria are generally subjective and are useful in narrowing down the array of possible alternative plans. With the exception of completeness, these criteria are also useful in screening potential measures.

- Completeness. Completeness is a determination of whether or not the plan includes all elements necessary to achieve the objectives of the project. It is an indication of the degree to which the outputs of the plan are dependent upon the actions of others. Plans that depend upon the actions of others to achieve the desired output were dropped from consideration.

- Effectiveness. Effectiveness is the extent to which a measure or alternative plan achieves the planning objectives. Measures or alternative plans that clearly make little or no contribution to the planning objectives were dropped from consideration.

- Efficiency. Efficiency is a measure of the cost effectiveness of the plan expressed in net benefits. Benefits can be both monetary and non-monetary. Measures or alternative plans that provided little benefit relative to cost were dropped from consideration.

- Acceptability. Acceptability is a measure of the ability to implement a measure or alternative plan. In other words, acceptability means a measure or plan is technically, environmentally, economically, and socially feasible. Unpopular plans are not necessarily unfeasible, just disliked. Measures or plans that were clearly not feasible were dropped from consideration.

Measures and plans that pass the screening criteria are evaluated and compared against more specific evaluation criteria. Evaluation criteria are described later in Section 3.12. Evaluation criteria can include costs, outputs, or effects and reflect the planning objectives or constraints. Some or all of the evaluation criteria may be used at various stages in the plan formulation process to compare alternative plans. Effective evaluation criteria must be measurable and reveal differences or trade-offs between alternative plans.

3.3 FEDERAL OBJECTIVES

Ecosystem restoration is one of the primary missions of the Corps of Engineers Civil Works program. The Corps objective in ecosystem restoration planning is to contribute to national ecosystem restoration (NER). Contributions to national ecosystem restoration (NER outputs) are increases in the net quantity and/or quality of desired ecosystem resources. Measurement of NER is based on changes in ecological resource quality as a function of improvement in habitat quality and/or quantity and expressed quantitatively in physical units or indexes (but not monetary units). These net changes are measured in the planning area and in the rest of the Nation.

3.4 PUBLIC CONCERNS

A number of public concerns have been identified during the course of Upper York Creek Dam removal study. Public concerns for this project have been gathered formally and informally from stakeholders. The non-Federal sponsor, the City of St. Helena, regularly represented the general public that would be affected by changes along York Creek. A formal public meeting will be held in Summer 2006 to present the draft DPR in order to gather public comment.

Stakeholders who have attended regular project team meetings and contributed to the formulation of public concerns, problems, opportunities, constraints, measures, and alternatives include the following:

- U.S. Army Corps of Engineering Regulatory Branch (Corps Regulatory)
- California Department of Fish and Game (DFG)
- California Regional Water Quality Control Board (RWQCB)
- City of St. Helena (City)
- Department of Water Resources (DWR)
- Napa County District Attorney's office
- National Marine Fisheries Service (NMFS)
- United States Fish and Wildlife Service (USFWS)

3.4.1 ECOLOGICAL CONCERNS

- NMFS has recognized that Upper York Creek Dam is a complete barrier to upstream fish migration and specifically blocks passage for federally listed steelhead (Oncorhynchus mykiss) in the threatened Central California Coast (CCC) Evolutionary Significant Unit
- York Creek is one of the most significant spawning and rearing streams for steelhead within the Napa Basin (NCRCD, 2005).
- The channel of York Creek that is blocked by the dam offers excellent rearing and spawning habitat. Creating access to these areas will greatly benefit the overall steelhead population (NCRCD, 2005).
- Approximately 26,000 cubic yards of sediment has accumulated behind the dam. In the past, 4 documented uncontrolled releases of the accumulated sediment from the reservoir have caused kills of fish and other aquatic organisms. The most recent silt discharge occurred in July 1992 during routine maintenance of the reservoir outlet structure. A solution is needed to remedy sedimentation issues. Future flood events could cause additional releases and fish kills.
- Water quality and the avoidance of downstream turbidity during construction is a concern.
- There is potential for the occurrences of endangered species including the California freshwater shrimp, California red-legged frogs, and California spotted owl at the project location.
- ESA Consultation: NMFS is concerned with "take" as defined by the ESA of steelhead. "Take" could occur with certain construction practices and because of pumping and diverting water around the construction site.
- Restoration should mimic the natural stream configuration, limit the use of riprap, and not use walls or gabions.
- There is interest in preserving large redwood trees at the project site.

3.4.2 SEDIMENT CONCERNS

- Sediment would need to be sampled and tested so that concerns about contaminants can be thoroughly evaluated. This would also be important for determining how the sediment can be disposed of or used.

3.4.3 STABILITY CONCERNS

- Streambank and streambed erosion after dam removal should be considered during planning and design.
- Mountain Spring road is adjacent to the project site and is a major route connecting St. Helena to Highway 101 and the City of Santa Rosa. Any project work done by the Corps need to account for slope stability concerns in the project area so that the road is not at risk in the future.
- Resource agencies have expressed concern about the Corps' use of hardened structures and use of concrete.

3.4.4 LEGAL CONCERNS

- After the 1992 sediment discharge, the DFG filed a complaint with the Napa County District Attorney. In 1993, DFG and the Napa County District Attorney's Office obtained an injunction in State Superior Court ordering the City to remove Upper York Creek Dam. Because of this legal action, the City of St. Helena agreed to a settlement in 1993 that mandated the removal of Upper York Creek Dam.
- The Superior Court of Napa County dismissed the injunction against the City. The dismissal of this injunction has allowed the City to partner with the Corps' Civil Works Program, San Francisco District, to begin a study on the removal and restoration of Upper York Creek Dam.
- To show the District Attorney's Office that the City of St. Helena is making best efforts to remove the dam, the City would like the project constructed in a timely manner. Draft notes from the "Stakeholder Workgroup Meeting" on February 28, 2001 note that the City was to show the DA's office that it is "making best efforts to remove the dam" by summer 2002.

3.4.5 OTHER CONCERNS

- Because dam was constructed circa 1900, it is considered a historical structure. There is some question about whether the masonry work or design of the outlet structure is of importance.
- It is unknown whether there are archaeological resources near the site that might be impacted by project.
- Noise and safety issues due to truck traffic should be addressed.
- The window for in-stream construction work is June 15 to October 15 of each year.
- Hauling traffic will be subject to potential delays and re-routing beginning in mid-September as wine production traffic increases during harvest and crush.
- Modification to the dam and construction activities should strive to not compromise the integrity or stability of utilities.

3.5 PROBLEMS AND OPPORTUNITIES

The evaluation of public concerns, as described in the previous section, often reflects a range of needs, which are perceived by the public. This section describes those needs in the context of problems and opportunities that can be addressed through the Corps' water and related land resource management.

Problems are undesirable conditions to be changed through the implementation of an alternative plan. Opportunities are positive conditions to be improved by an alternative plan. The difference between problems and opportunities is often simply a matter of perspective. For each problem and opportunity, the existing conditions and the expected future conditions are described.

On July 9, 2003, the Corps' project delivery team (PDT) met to brainstorm Problems, Opportunities, Objectives and Constraints associated with the project. The next sections list the finalized versions of the problems and opportunities that were initially discussed in 2003. For more information regarding the synthesis of the plan formulation of UYC, please refer to Appendix L: Plan Formulation.

3.5.1 PROBLEMS

- **PROBLEM: Upper York Creek Dam is an impassible barrier for fish and aquatic wildlife.**

  Upper York Creek Dam is approximately 50 feet high and 140 feet long and has been identified by NOAA Fisheries as a completely impassable barrier to approximately 2 miles of upstream migration and spawning habitat for the federally listed CCC steelhead. The channel of York Creek that is impacted under the current conditions is known to provide spawning and rearing habitat for CCC steelhead. The dam also blocks access and dispersal patterns for resident fish and other aquatic wildlife to suitable aquatic habitat above and below the dam (i.e. amphibians, other, fresh water shrimp, turtles, aquatic invertebrates, etc).

  Future without project conditions assumes that Upper York Creek Dam would not be removed. The existing dam would continue to be an impassable barrier for fish passage to upstream spawning habitat for the federally listed steelhead. Additionally, the presence of the dam and sediment basin creates an unnatural dispersal barrier to for resident fish and other aquatic species.

- **PROBLEM: Four documented releases of accumulated sediment trapped behind Upper York Creek Dam have caused downstream habitat degradation and fish kills. There is a potential for future releases and fish kills.**

  It is estimated that approximately 26,000 cubic yards of accumulated sediment is trapped behind the dam and that an additional 1,300 cubic yards continues to accumulate annually (Appendix A: Hydrology and Hydraulics).

According to a DFG letter dated July 30, 1992, there have been accidental sediment releases in 1965, 1973, 1975, and 1992. In each incidence, “dense anaerobic sediments, high in toxic hydrogen sulfide, were released from the dam and deposited in pools and riffle areas downstream, quickly suffocating and burying all fish and aquatic invertebrates within a mile or more of the dam” (DFG, July 30, 1992).

Most recently, the 1992 catastrophic accidental release resulted in a silt discharge “within the stream bed from the face of the dam to a point where the Napa River joins the stream” (DFG, July, 1992). The total distance of impact was approximately 2.5 to 3 miles long. The depth of the silt deposits varied from heavy deposits (up to 18 inches) just below the dam and continuing downstream for about 0.5 miles, gradually thinning until only a light covering of fine silt was deposited a the confluence with the Napa river (DFG, July 1992; DFG Aug 1992).

In a letter dated August 4, 1992, John Emig of DFG reported that two days after the 1992 release, “pools were filled in, riffles were covered, and extensive deposits were found on stream banks. The stream was highly turbid throughout the entire downstream area.” Mr. Emig also informally counted the following dead aquatic species: 1 rainbow trout, 6 crayfish, 7 sculpin, 109 tadpoles, 139 golden shiners. According to an October 1992 synopsis of the release, “there [was] a total loss of aquatic life. The organisms which formerly survived had been smothered by the silt as it was deposited on the stream bottom” (DFG, Oct 1992).

Future without project conditions assumes that the dam would remain in place and that the threat of sediment release and fish and aquatic organism kills remains. It is possible that the non-Federal sponsor would periodically remove sediment from behind the dam which would temporarily lower the threat of sediment releases and fish kills downstream. However, only removal of the accumulated sediment coupled with the removal or breaching of the dam to allow for natural sediment transport could permanently reduce the threat of downstream sediment release and aquatic organism kills in the future.

- **PROBLEM: Upper York Creek Dam has caused aquatic and riparian habitat degradation upstream of the dam.**

Upper York Creek Dam, and sediment accumulation due to the dam, has destroyed approximately 3 acres of aquatic and riparian habitat above the dam. Originally the reservoir was dug for water supply purposes and had a 10,000,000 gallon storage capacity. Today, the original creek bed is buried beneath 17 to 29 feet (approximately 28,000 total cubic yards) of accumulated sediment).

The riparian and aquatic habitat in the project area has been compromised for over 100 years due to the presence of the dam and reservoir. Riparian habitats immediately upstream and downstream of the project are comprised of lush riparian habitat whereas the project site riparian habitat is sparse and limited. It is believed that a restored aquatic and riparian corridor through the project site would better support native populations of riparian and aquatic wildlife species by providing increased canopy, cover, foraging, and shelter habitat.

A temporary wetland complex had begun to develop over the accumulated sediment as the sediment basin is filled with annual flows. However, this is not the natural habitat type for this location.

Future without project conditions assume that Upper York Creek Dam would not be removed. The natural habitat has been degraded by construction of the dam, and neglect. This has resulted in a large influx of sediment that has created a sediment basin behind the dam that gets larger each year.

The 2005-2006 storm season led to the additional accumulation of approximately 8,000 cubic yards of sediment. The sediment accumulated both within the sediment basin and upstream of the reservoir. This suggests that without project conditions will lead to additional sedimentation both within and upstream of the project area.

It is possible that the non-Federal sponsor would periodically remove sediment from behind the dam. These future maintenance efforts would likely inhibit the growth of riparian vegetation and would favor the growth of exotic vegetation.

Without the project, further aquatic and riparian habitat degradation is expected.

3.5.2 OPPORTUNITIES

- **OPPORTUNITY: To provide connectivity for ecological processes for all fish and wildlife species that live in the aquatic and riparian habitat upstream or downstream of the dam**

  Upper York Creek Dam acts as an ecological barrier to fish and wildlife species that live within the creek. The removal of the dam would restore the natural connectivity of the riverine habitat(s) and would allow fish and wildlife populations to disperse and migrate naturally migrate though their natural habitat range.

  Future without project conditions assume that Upper York Creek Dam would not be removed. The dam would remain as a barrier to natural fisheries and wildlife populations.

- **OPPORTUNITY: To beneficially reuse the dam material and sediment at various project sites.**

  There is an opportunity to beneficially reuse the project sediment and dam material at various locations. These opportunities include potential reuse at the City's Lower Reservoir. Other opportunities include reuse at private vineyards or for the City's flood control project at Fulton Lane.

3.6 PLANNING OBJECTIVES

The national objectives are general statements and not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired positive changes in the without project conditions. The planning objectives are specified as follows:

- **OBJECTIVE: Improve fish passage.** To restore the natural aquatic migration and dispersal corridor for all life stages of the federally listed CCC steelhead in the York Creek watershed by reconnecting spawning, rearing, and migratory aquatic habitat from downstream of the dam to approximately 2 miles upstream.

- **OBJECTIVE: Reduce future downstream habitat degradation and fish kills.** To reduce the risk of uncontrolled sediment releases that have been shown to cause fish and aquatic organism kills downstream of the dam and to restore a natural sediment transport system (fluvial process) through the project area.

- **OBJECTIVE: Habitat Restoration.** To restore approximately 3 acres of degraded riparian and riverine habitat at and above Upper York Creek Dam.

- **OBJECTIVE: Connectivity.** To provide aquatic and riparian migration and dispersal connectivity for fish and wildlife populations through the project site.

3.7 PLANNING CONSTRAINTS

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. The planning constraints identified in this study are as follows:

- **CONSTRAINT: Species of Concern.** There are potentially a number of state and federally listed species such as the California freshwater shrimp, northern spotted owl, and steelhead. As of June 2006, completed wildlife surveys have not found any of these species at the project site. The Corps will use existing survey information and/or complete further surveys, as necessary, to determine the presence of threatened and endangered (T&E) species at the project site. It is believed that current project alternatives would benefit most T&E species and that minimally, that they would not negatively impact these species. If implemented, the Corps will use best management construction practices to minimize construction-related impacts to T&E species.

- **CONSTRAINT: Spring Mountain Road.** Spring Mountain Road is owned by Napa County and is a major conduit between St. Helena and Santa Rosa as well as to wineries located between the two cities. Landslide and road stability near the dam area is a concern because there are no feasible alternate route. The Corps will continue to work with the City and Napa County to ensure that the project would not jeopardize the stability of the road.

- **CONSTRAINT: Utilities and other existing structures.** Modifications to the dam and construction activities cannot compromise the integrity or stability of utilities.

3.8 DESIGN CONSIDERATIONS

The below considerations have been taken into account for the design of project alternatives.

- **CONSIDERATION: Construction Access.** Access to the project area is difficult due to: 1) the location of the dam and creek channel immediately adjacent to a public road; 2) the configuration of the project site; and 3) instability of the channel sides. These factors would create challenges to construction mobilization and demobilization.

- **CONSIDERATION: Construction Window.** The window for in-stream construction work is June 15 to October 15 of each year due to agency regulations and wildlife lifecycles.

- **CONSIDERATION: Erosion.** Project alternatives should strive to reduce erosion in the stream corridor.

- **CONSIDERATION: Hardened Structures.** Resource agencies have expressed concern about the Corps' use of hardened structures and concrete. The Corps would work to mimic natural habitat configurations, limit the use of riprap where possible, and use no walls or gabion, to the extent possible.

- **CONSIDERATION: Natural "Waterfall" Rock Outcrop Beneath Dam.** A rock outcrop under the dam could cause more difficulty when trying to construct a stream for fish passage as a natural outcropping could prove to be a pre-existing fish passage barrier. The natural geology of the project area would be studied, to the extent possible, during feasibility. Because it would be enormously expensive, as well as seemingly unnecessary, to do extensive underground geological investigations, adaptive management would need to be followed once the dam is removed and/or notched. This would allow the construction team to determine how to best utilize the natural geology of the project site for creek construction.

- **CONSIDERATION: Spring Mountain Road.** The Corps would work with the City and County to plan for construction related traffic impacts on Spring Mountain Road.

- **CONSIDERATION: Water Quality.** Construction activities should be conducted so as not to degrade water quality downstream of the project site.

3.9 PLANNING CONSIDERATIONS

- **CONSIDERATION: Comply with local land use plans.** Community plans and guidelines have been created by the City of St. Helena and other local stakeholders. To the extent possible, the Corps would follow the guidelines established by the City of St. Helena's General Plan as well as the Community Coalition for a Napa River Flood Management Plan/Design Review Committee's "Goals and Objectives for a "Living" Napa River System."

- **CONSIDERATION: Environmental Operating Principles.** The Corps has reaffirmed its commitment to the environment by formalizing a set of "Environmental Operating Principles" applicable to all its decision-making and programs. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialogue on environmental matters, and ensure that employees consider conservation, environmental preservation, and restoration in all Corps activities. The Environmental Operating Principles are:

  - Achieve Environmental Sustainability.
  - Consider Environmental Consequences.
  - Seek Balance and Synergy.
  - Accept Responsibility.
  - Mitigate Effects.
  - Understand the Environment.
  - Respect Other Views.

- **CONSIDERATION: Operations and Maintenance (O&M).** The City of St. Helena prefers alternatives that minimize future O&M.

- **CONSIDERATION: Redwood Trees.** Regulatory agencies have expressed a concern to preserve the large redwood trees that have grown on the downstream face of the dam. The Corps will continue to work with regulatory agencies to ensure that any loss of large redwood trees, necessary for the selected alternative, is unavoidable and will plant redwoods within the project site for replacement. Additionally, the revegetation and restoration plan currently includes the planting of redwood trees.

- **CONSIDERATION: Safety and Recreation.** Public safety in the project area must be considered both during and after construction.

- **CONSIDERATION: Water Supply or Flood Control Impacts.** The Corps would avoid or mitigate for negative adverse effects on water supply, and flood control impacts.

Figures 3.1 and 3.2. Lower Reservoir

3.10 MEASURES

A measure is a feature or an activity that can be implemented at a specific geographic location to address one or more planning objectives.

3.10.1 PRELIMINARY MEASURES

The Corps Project Delivery Team (PDT) held its initial Preliminary Alternatives meeting on November 20, 2003, where measures were brainstormed to address the problems and opportunities that came out of the July 9, 2003 "problems and opportunities" brainstorming meeting.

The purpose of the brainstorming session was to consider all possible measures for addressing the objectives. Many of these measures were quickly eliminated from consideration because they were infeasible and/or unacceptable. This initial list of measures can be read in Appendix L: Plan Formulation. The table below is the second iteration of measures from the brainstorming session. As seen in this table, these measures were either retained or dropped for further consideration.

Table 3.2. Summary of Preliminary Screened Measures for Preliminary Project Objectives.

Measure	Retained	Dropped	Rational
Objective: Improve Fish Passage			
Build fish ladder	X		Measure is included for Alternative 3
Dam Removal	X		Measure included for Alt 1
Dam Removal and regrade	X		Measure included for Alt 1
Notch/Partial removal of dam	X		Measure included for Alts 2A, 2B, 3
Sediment Removal	X		Measure is included in all action Alternatives
Increase flow		X	No water source and does not meet restoration objectives.

Fish bypass		X	Topographically infeasible to construct in site's narrow canyon
Fish escalator		X	Cost prohibitive/Not practical in this watershed
Fish hatchery		X	Does not meet objectives for natural fish passage or restoration
Fish lift		X	Cost prohibitive/Not practical in this watershed
Fish tube		X	Cost prohibitive/Not practical in this watershed
Landscape improvement		X	Measure included in all action alternatives
Reroute creek around dam		X	Topographically infeasible to construct in site's narrow canyon
Restore instream habitat	X		Measure included in all action alternatives
Trap and truck fish around dam		X	Cost prohibitive/Not practical in this watershed
Objective: Eliminate threat of downstream fish and aquatic wildlife kills due to sediment releases			
Sediment Removal	X		Measure included in all action alternatives
Leave sediment/take no action	X		Measure part of “No action alterative.”
Relocate sediment somewhere allowable	X		Measure included in all action alternatives
Reuse sediment at project site	X		Measure included in all action alternatives
Stabilize sediment to reduce threat of catastrophic release	X		Erosion control and revegetation would be used to stabilize remaining sediment
Stabilize existing sediment		X	Does not meet overall project objectives
Watershed sedimentation management		X	Not within scope of this project.
Objective: Reduce Erosion*			
Bioengineering techniques	X		Such measures are included in all action alternatives
Do nothing	X		No Action Alternative
Grade control measures	X		Please refer to specific measures: J-hook weirs, etc.
Leave large trees to reduce erosive effects of rainfall	X		Revegetation Feature.
Meanders	X		Measure included in all action alternatives
Plant aquatic vegetation	X		Revegetation Feature.
Plant deep-rooted vegetation	X		Revegetation Feature.
Regrade and stabilize stream banks	X		Measure included in all action alternatives

Rip rap	X		Measure included in all action alternatives
Animal access: Restrict		X	Not Necessary
Buy out vineyards and revegetation		X	Not feasible due to expense.
Concrete trapezoidal channel		X	Does not meet restoration objectives
Public access: Restrict		X	Not Necessary
Sand bags		X	Not Necessary
Silt curtains	X		Design and Implementation phase detail
Objective: Habitat Restoration			
Aquatic Habitat Creation: Boulders, Large Woody Debris, Plant shade canopy plants	X		Incorporated into planning; to be further assessed in the Design and Implementation Phase.
Do nothing	X		No Action Alternative
Channel Design: Mimic Natural Design (Meanders, pools, riffles)	X		Measure included in all action alternatives
Riparian revegetation with native vegetation	X		Revegetation Feature.
Sediment Removal	X		Measure included in all action alternatives
Floodplain terrace banks	X		Included in Alternatives 1, 2A
Passive Restoration of Vegetation		X	Inappropriate; erosion and invasive vegetation concerns
Public access limitation		X	Not necessary

* Preliminary Objective; this objective was not retained for final array of objectives.

3.10.1 FINAL MEASURES

Generally, measures are the building blocks that are grouped together to form alternative plans. The measures listed above were screened through meetings and the planning design phase to determine whether each measure should be retained for use in the formulation of the final array of alternative plans. Table 3.2 is a summary of the measures included in the final array of alternatives for feasibility analysis. Please refer to the Plan Formulation Appendix for the original array of measures.

Table 3.2. Summary of Final Measures and the Project Objectives Each Measure Meets.

General Measures	Objectives			
	Improve fish passage	**Reduce risk of sediment release**	**Habitat Restoration**	**Aquatic Connectivity**
Aquatic Habitat Creation: Boulders, Large Woody Debris, Plant shade canopy plants	**X**		**X**	
Channel Restoration (Includes creation of aquatic habitat: meanders, pools, riffles)	**X**		**X**	**X**
Dam Removal	**X**		**X**	**X**
Erosion Control		**X**	**X**	
Fish ladder	**X**			**X**
Floodplain terrace banks			**X**	
Notch/Partial Removal of Dam	**X**		**X**	**X**
Revegetation	**X**		**X**	
Sediment Removal and disposal/reuse	**X**	**X**	**X**	**X**

3.10.1.1 Description of Final Measures

Channel Restoration and Creation of Aquatic Habitat

Channel restoration would include design features of pools, riffles, and runs in the channel. Specifically, pools, riffles, and runs would be incorporated into design. Local cobbles, woody debris, and other native material would be used to create the restored channel.

Dam Removal and disposal/reuse

The 50-foot high and 140-foot-long earthen dam (16,284 cubic yards of material) would be removed, as wood the right wall of the 225-foot-long concrete spillway, the 6-foot diameter steel riser pipe, and trash rack. This would restore fish passage through the dam site. Two potential disposal sites have been identified for this project. The first site is the City's lower off-stream reservoir to York Creek (Lower Reservoir), which is located about one mile down Spring Mountain Road from the project site. The second location is Clover Flats, a permitted landfill that is located within 10 miles of the project site.

Erosion Control

Permanent erosion control vegetation in habitat areas would consist of native vegetation. Erosion control for disturbance from construction activities outside habitat areas would consist of grasses best suited for the areas needing protection.

Fish ladder

The fish ladder would allow for fish passage over the dam. The dam would be lowered as necessary to construct a concrete fish ladder through the notch and over the dam. This would provide for upstream steelhead migration.

Floodplain terrace banks

The creation of floodplain terraces were favored by resource agencies in order to provide for more potential riparian habitat.

Notch/Partial Removal of Dam

A notch or partial removal of the dam would require the removal of approximately 70% of the earthen dam structure. A restored creek would then be constructed though the dam site.

Revegetation

Habitat revegetation would provide roughly 2 acres of riparian vegetation, erosion control, and shade canopy for aquatic and wildlife species. This is the disturbed area for all alternatives.

Sediment Removal and disposal/reuse

Accumulated sediment would need to be removed to create a restored creek through the project site. The material would be sorted, and materials necessary for restoration would be stockpiled. The remaining material would be taken to off-site areas for storage and reuse. As with the dam material, two primary disposal sites have been identified. The first site is the Lower Reservoir, and the second is Clover Flats.

3.11 FORMULATION AND EVALUATION OF PRELIMINARY ALTERNATIVES

A preliminary and then a final array of alternatives were developed, evaluated, and compared to identify a plan that reasonably maximizes the NER benefits. It is important to note that the preliminary array of alternatives primarily focused on various measures to address the fish passage objective. This was done as this specific objective demanded the most intensive engineering and design effort for this restoration project. This objective also most directly affects the outcome of all project objectives.

Below is a list of general concepts that the Corps’ PDT used to narrow down the possible measures to address fish passage. Generally, these concepts range from alternatives focused on full dam removal to those avoiding removal while still attempting to achieve fish and aquatic organism passage.

General Concepts for Alternative Development:

- Remove dam and build a support structure for slope stability.
- Remove dam and re-route road to avoid slope stability issues.
- Modify or notch the dam down to the stream bed.
- Modify or notch the dam part way to stream bed and build a fish ladder or fish passage structure over remaining dam.
- Do not remove or modify the dam. Build a new fish ladder or fish passage structure over dam.
- Re-route the creek around dam.

Based on the above concepts, the following is a list of preliminary alternatives that were developed. Included is a general description of the initial seven alternatives.

3.11.1 PRELIMINARY ALTERNATIVES:

- No-Action
- Alternative 1 - Remove dam and build support structure for slope stability.
- Alternative 2 - Remove dam and re-route road to avoid slope stability issues.
- Alternative 3 - Modify (notch/lower) dam to stream bed to create hydrologic connectivity.
- Alternative 4 - Modify (notch/lower) dam part way to stream bed and build fish ladder.
- Alternative 5 – Do not remove or modify dam. Build a fish ladder over dam.
- Alternative 6 – Re-route York Creek around dam.

Table 3-4. Preliminary List of Alternatives.

Al #	Description of Alternative	Retained	Dropped	Rational
No Action		X		
1	Remove dam and build support structure for road	X		
2	Remove dam and reroute road		X	Not effective. There is no feasible alternate route.
3	Modify (notch/lower) dam to stream bed	X		
4	Modify (notch/lower) dam part way to stream bed and construct fish ladder	X		
5	Dam remains as is with a new fish ladder		X	Not efficient. Constructing a ladder over a 50 foot dam to a level above the natural streambed is impractical for fish passage.
6	Reroute creek		X	Neither effective nor efficient. There is no feasible alternative route without blasting through canyon walls to an alternative watershed.

3.11.1.1 No Action Alternative

This alternative means to do nothing. The Corps is required to consider the option of "No-Action" as one of the alternative plans in order to comply with the requirements of the National Environmental Policy Act (NEPA). With the No-Action alternative, which is synonymous with the "future without-project condition," it is assumed that no project would be implemented by the federal government or by the local interests to achieve the planning objectives. The No-Action Alternative serves the planning process by providing the base against which all other alternatives are measured and ensuring that any action taken is more in the public interest than doing nothing.

3.11.1.2 Alternative 1- Remove dam and build support structure for slope stability

The preliminary version of Alternative 1 involved removing the dam, spillway, and all sediment behind the dam. The goal of this alternative was to maximize the hydrologic passage and to return the entire project area to a more natural state while enhancing fish and aquatic organism passage. The removal of these structures would require support structures for the slope and specifically for maintaining the integrity of Spring Mountain Road. If necessary, a structure would be built to help support/stabilize Spring Mountain Road.

Initial geotechnical investigations found that although Alternative 1 seemingly provided for the most effective restoration of a natural creek system, that complete removal of the dam, spillway, and sediment could results in the greatest slope failure risk. This would likely require the greatest amount of effort to maintain the Spring Mountain Road. Extensive explorations, complex design, and a large construction cost would likely be required and it was thought that this could be beyond the scope of a CAP section 206 project.

3.11.1.3 Alternative 2 - Remove dam and re-route road to avoid slope stability issues

Alternative 2 was removed from study consideration as it became clear in discussions with the City of St. Helena, that re-routing Spring Mountain Road was not a feasible option. Spring Mountain Road is owned by Napa County and is a major conduit between St. Helena and Santa Rosa as well as to wineries located between the two cities. There is no other feasible alternate route.

3.11.1.4 Alternative 3 - Modify (notch/lower) dam to stream bed to create hydrologic connectivity

The preliminary version of Alternative 3 involved removing a portion of the dam and leaving the spillway in place (i.e., "cutting a notch" in the dam). The goal of this alternative is to allow for adequate fish passage while minimizing the total alternative costs and thus removing only necessary sediment from behind the dam to meet project objectives. Initial geotechnical analysis found that notching the dam would have less impact on slope stability integrity as well as the integrity of Spring Mountain Road. If necessary, a structure(s) would be built to help support/stabilize Spring Mountain Road.

The Site and Alternatives Evaluation report produced by the Sacramento District Army Corps of Engineers found that the notch should be located as far toward the right bank as possible (looking downstream) to maximize slope stability and the integrity of Spring Mountain Road. The report also recommended that the notch be excavated such that the cut slopes are 1.5H to 1.0V. Erosion protection is recommended at the toe of the new cut slopes in the vicinity of the dam.

To the extent feasible, the natural channel dimensions used for Alternative 1 should be constructed through and above the notch.

3.11.1.5 Alternative 4 - Modify (notch/lower) dam part way to stream bed and build fish ladder

Alternative 4 involves removing a portion of the dam, or possibly excavating a notch in the dam, and constructing a new fish ladder through the notch. A fish ladder was one of the first alternatives considered conceptually in the planning process. Initial investigations into various fish ladders found that a ladder could potentially provide juvenile passage, be installed without requiring demolition of the dam, and involve less earth grading upstream of the dam. Selection of a fish ladder style depends on a number of factors, including fish species and age class, scale of channel, hydrology, flow control available, and the channel debris and sediment load. York Creek is a small, non-gauged creek with large variation in flows and unknown debris and sediment load, which makes selection of an appropriate fish ladder difficult. Ladders that can accommodate very low flows - like pool and weir and Denil types - cannot operate over a wide variety of flows and are affected by sediment and debris.

3.11.1.6 Alternative 5 – Do not remove or modify dam. Build a fish ladder over dam.

Alternative 5 was removed from study consideration as building a fish ladder up and over a 50 foot tall dam proved impractical for fish passage as well as cost prohibitive. The most suitable fish passage structures for this option are Denil or Steeppass fishways. These structures would most likely have a steep gradient that would be difficult for fish to navigate and may require a significant amount of maintenance.

3.11.1.7 Alternative 6 – Re-route York Creek around dam.

Alternative 6 was removed from the study list. At the project location, the creek flows through a narrow canyon and there is no practical alignment to reroute the creek aside from blasting though the canyon walls to another watershed. This was considered inefficient and ineffective and would not meet the objectives of fish passage and habitat improvement.

As noted in the previous chapter, the six action alternatives were screened based on planning constraints and considerations listed in Chapter 2 of this document. Alternatives 1, 3, and 4 were selected to be further analyzed and screened in further feasibility. These remaining alternatives were renumbered sequentially (1-3) to simplify the comparisons of alternatives for the project team and readers of this document. The final alternatives are now differentiated by the portion of dam removed where Alternative 1 provides the greatest portion of dam removal and Alternative 3 provides the least portion of dam removal.

In addition, one sub-alternative was added to feasibility-level analysis for analyzing two separate notch sizes. Separating Alternative 2 into Alternative 2A (large notch) and Alternative 2B (small notch) allowed the team to investigate whether there were different levels of project benefits and/or costs associated with increasing the size of the notch. In addition, this separation also allowed for a more thorough geotechnical comparison of the stability risks associated with dam removal. This will be discussed below in more detail.

Table 4.1 Final Array of Alternates.

Final Alternative	Description of Alternative
No-Action	No ecosystem restoration measures would be implemented.
Alternative 1: Complete Removal	Complete removal of dam and the right wall of the spillway. Complete removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.
Alternative 2A: Large Notch	Notch Dam: Maximum notch size based on slope stability constraints and ecosystem goals. 74% removal of dam and 95% removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.
Alternative 2B: Small Notch	Notch Dam: Minimize notch size to the minimum hydrologic passage of 23 feet due to slope stability constraints. 72% removal of dam and 95% removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.
Alternative 3: Fish Ladder	Modify (notch/lower) dam to existing streambed level above dam and construct fish ladder to this height. 37% removal of sediment. Restoration of natural channel and restoration of riverine and riparian habitat.

All alternatives include various levels of accumulated sediment removal, dam material removal, and revegetation. The revegetation plan for all alternatives would be similar as all alternatives would require revegetation of approximately 2 acres of disturbed area. The primary difference in the revegetation plan would be that Alternative 1 and 2A are designed with a floodplain terrace while Alternative 2B and 3 are not. Table 4.2 lists the basic differences between the project alternatives including the differences in total width of the excavated channel, as well as the amount of dam and sediment material removed for each alternatives.

Table 4.2. Details of Project Alternatives.

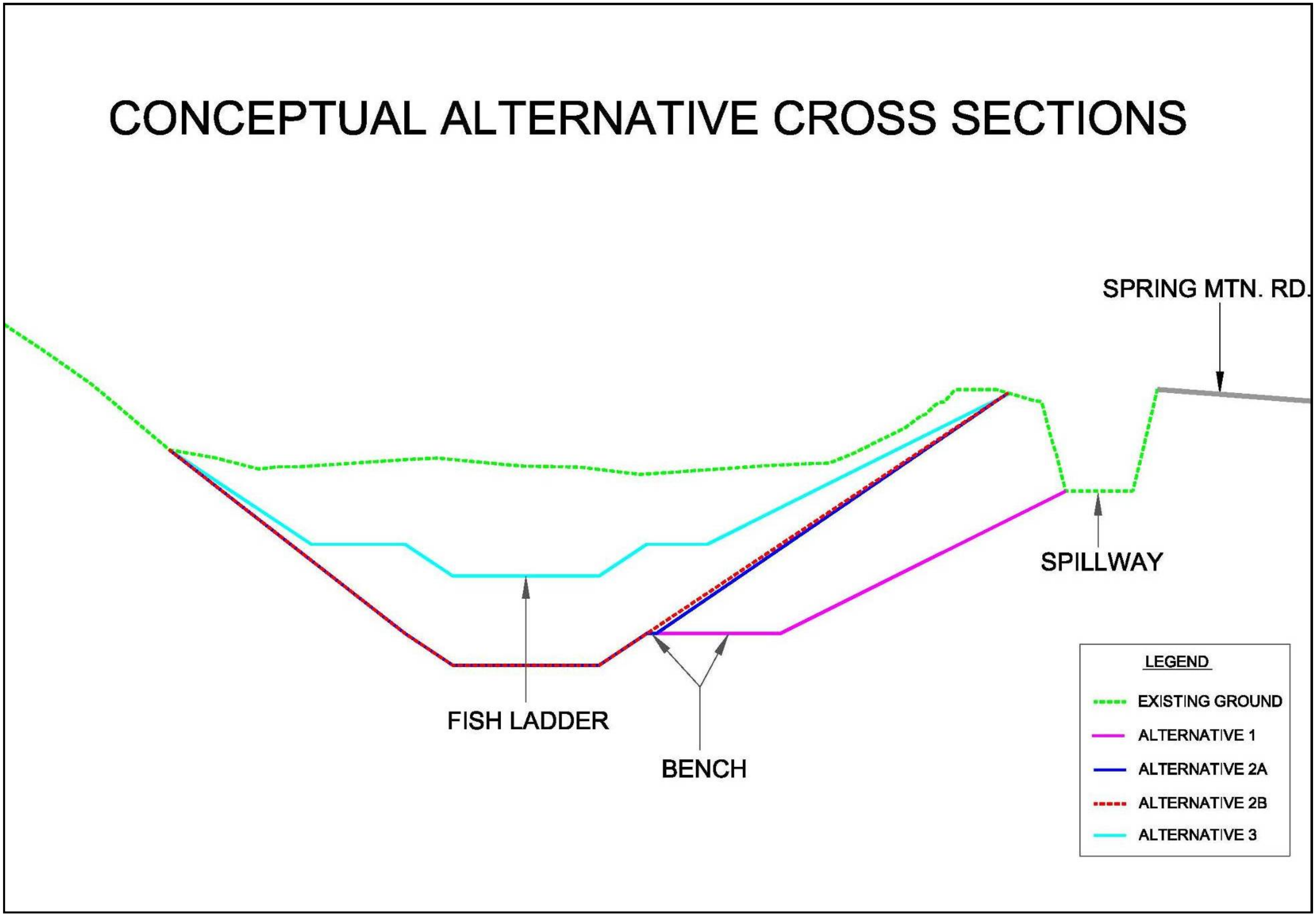
Alternative	Width of Total Excavated Channel (ft)	Constructed Stream Width (ft)	Constructed Bench Width (ft)	Dam Material			Reservoir Material	
				Dam Material Removed (Cubic yards)	Percentage of Dam Removed	Removal of Spillway	Reservoir Material Removed (Cubic Yards)	Percentage of Accumulated Reservoir Material Removed
No Action	NA	NA	NA	NA	NA	NA	NA	NA
1	53	23	30	16,284	100%	Right Wall Removed	28,100	100%
2A	32	23	1.5[2]	12,029	74%	No	26,637	95%
2B	23	23	0	11,777	72%	No	26,637	95%
3	23	23	0	8,431	52%	No	10,372	37%

Table 4.2. Details of Project Alternatives.

On the following page, in Figure 4.1 is a conceptual cross section of each alternative at it would appear through the dam.

[2] Alternative 2A was intended provide for a floodplain terrace through the dam. However, geotechnical slope stability constraints and the side slope requirement minimized the allowable floodplain terrace to only 1.5 foot.

Figure 4.1 Conceptual Cross Sections of Final Alternatives with Alternative 2A Included



4.1 NO ACTION ALTERNATIVE

The No Action Alternative assumes that no ecosystem restoration measures are implemented. There would be no action taken to modify Upper York Creek Dam from its current configuration, there would be no removal of trapped sediments from behind the dam, and no fish passage would be restored to the upper reaches of York Creek.

4.2 ALTERNATIVE 1: COMPLETE REMOVAL OF DAM AND RIGHT WALL OF SPILLWAY

4.2.1 SUMMARY OF ALTERNATIVE 1

Alternative 1 is designed to be the most complete removal of the dam. The entire earthen dam would be removed and looking upstream, the right wall of the spillway would be removed. This would provide for a total channel width of 53 feet. Because the determined width for the restored creek is 23 feet, this alternative could have up to a 30 foot bench.

In general, Alternative 1 includes the following: (1) removal of the entire earthen dam; (2) removal of all of the accumulated sediment from behind the dam; (3) construction and restoration of York Creek from just below the dam to just above the sediment basin with a slope of approximately 5%; (4) restoration of roughly 3 acres of aquatic and riparian habitat with native vegetation and; (5) use of native plants for erosion control and site stabilization.

4.2.2 DETAILED DESCRIPTION OF ALTERNATIVE 1

4.2.2.1 Removal of Dam, Spillway, and Drainpipe

Alternative 1 includes the removal of the 50-foot high and 140-foot-long earthen dam (16,284 cubic yards of material), the removal of the right wall of the 225-foot-long concrete spillway, and the removal of the 6-foot diameter steel riser pipe and trash rack.

As seen below in Table 4.3, the volume of material that would be removed has been separated into 3 reaches: Reach 1 is the material accumulated downstream of the dam; Reach 2 is the dam material; and Reach 3 is the reservoir sediment located behind the dam.

Two primary disposal sites have been identified for this project. The first site is the City's Lower Reservoir. The second location is Clover Flats, a permitted landfill that is located within 10 miles of the project site. For detailed disposal inforation, please refer to Chapter 4, section 4.2.1.1 Accumulated Sediment Disposal and Reuse

Table 4.3. Alternative 1: Quantity of Dam and Sediment Removal.

Alternative 1: Estimated Dam and Sediment Removal Quantity in cubic yards (yd^3)	
Reach 1: Downstream Sediment	1,025
Reach 2: Dam Material	16,284
Reach 3: Reservoir Sediment	28,100
Total	45,409

4.2.2.2 Accumulated Sediment Removal

As seen in Table 4.3, the estimated amount of accumulated sediment to be removed from behind the dam is 28,100 cubic yards. Before the dam and sediment material is hauled off, it would be sorted, and materials necessary for restoration would be stockpiled. It is estimated that approximately 400 cubic yards of dam material is needed to recontour the channel.

As mentioned in the previous section, two primary disposal sites have been identified. They include the Lower Reservoir and Clover Flat. For detailed disposal inforation, please refer to Chapter 4, section 4.2.1.1 Accumulated Sediment Disposal and Reuse

4.2.2.3 Channel Restoration

The primary difference between the alternatives is that Alternatives 1, 2A, and 2B would be constructed as close as possible to flow through the historical channel whereas Alternative 3 would be constructed from the top of the fish ladder (over dam) and through the remaining sediment basin. Specifically, the Alternative 3 channel would be constructed 10-12 feet above the original channel bed.

Floodplain Terraces
Based on modeling results and representative stream reaches and cross-sections from upstream of the project area, the suggested constructed creek width is cross section 23 feet wide and 5 feet deep with a floodplain terrace measuring from 2 to 50 feet, depending on the location in the project site. Larger benches are possible in the center of the reservoir area.

Meander Design
In order to determine how the restored channel will flow through the project site, an approximate meander wavelength from the representative reach area was used. The representative reach used is immediately upstream of the proposed restoration area and has a similar slope.

Channel Bottom Material
The existing channel bottom material in the representative stream reach consists mostly of boulders and cobbles for the entire width of the stream. It is suggested that the excavated stream channel be lined throughout its entirety with cobbles and boulders of similar gradation to that which is found in the representative stream reach.

Excavation and Cut Slopes
The excavation angle into the floodplain terrace and hillsides above the channels would ideally have been 2H:1V for long term stability, but since the natural hillside slope angles (west slopes) are as steep as 1H:1V in places, steeper cuts may be necessary.

Channel Restoration Design
Two specific channel restoration designs have been developed from these dimensions and parameters mentioned above.

The first channel design (Channel Design 1) would be designed to include all features of a functioning creek. The design will include channel cross-sections, plan form, pools and riffles, channel slope and bottom material. For detailed information on Creek Design One, please refer to plates 3 -6 of Appendix A: Hydrology and Hydraulics and to Sheets 2, 3-1 through 3-10, 4, 5, 6, and 7 of Appendix B: Civil Design Engineering

The second channel design (Channel Design 2) would be limited to a basic cross-section, plan, slope, and bottom material. Pool and riffles would be allowed to form naturally over time within this cross-section. The basic cross-section will be similar to the riffle detail on Plate 7 of Appendix A: Hydrology and Hydraulics.

Table 4.4. Creek Restoration Features

Channel Design	Features	Comments
1	channel cross-sections, plan form, pools and riffles, channel slope and bottom material	An attempt to restore the channel to its pre-dam configuration.
2	channel cross-section, plan form, channel slope and bottom material	Provides a simple cross-section*, plan and original slope. Pools, riffles, and bars will form over time. Recommended design.

* Similar to the riffle detail on Plate 7 of Appendix A: Hydrology and Hydraulics

Currently, the channel is designed as described above for Channel Design One. However, further geomorphic analysis has shown that Channel Design Two would provide the recommended restoration cross-sections, plan and slope requirements and that pools, riffles and bars would naturally form over time. It is likely that this method would be more cost effective and therefore will be further considered during the Plans and Specifications Phase.

For Channel Design 1, channel restoration includes design features of pools, riffles, and runs in the channel design. Specifically, there are 4 pools, 5 riffles, and 1 run included in initial design. The riffles are designed to be approximately 64 feet long, the pools 105 feet long, and the run to be between 69 and 92 feet long. These features are preliminary. Pool and riffle lengths for this design are purposely longer than representative reaches in York Creek. There is adequate existing sediment in the upper watershed that is expected to move downstream and into the project area. This sediment load would allow the engineered creek to adapt to its own equilibrium over time. Pools and riffles are expected to shorten until an equilibrium state is reached.

4.2.2.4 Revegetation

In general, the Habitat Revegetation Design provides a single methodology for revegetation that is applied to all of the project alternatives. The project would require revegetation of roughly 2 acres of disturbed area for all alternatives. Revegetation would focus on creation of self-sustaining native vegetative habitat, control of erosion and stabilization of the newly created stream channel.

Revegetation of the areas disturbed by construction would follow three vegetation types: Bank Zone, Terrace Zone, and Riparian Zone. These zones were based preliminary on hydraulic modeling to establish the elevations of the zones relative to the channel bed. These zones would be refined on the basis of further iterations of the detailed design of the recommend alternative.

Specifically, Alternative 1 would have 0.4 acres of Bank Zone, 0.6 acres of Terrace Zone and 1.2 acres of Riparian Zone. This would total 2.2 acres of habitat acreage.

The Bank Zone would be planted with emergent aquatic vegetation 0.5 to 3 feet above low flow water surface elevations. There would be 2 to 5 rows of plants, spaced 1 foot apart. Plants such as rush, sedge, wildrye, deergrass, willow and alder would be used. The Terrace Zone would be planted with woody plants placed 3 to 5 feet above the low flow water surface. Plants such as wildrye, deergrass, maple, elder, dogwood, buckeyes, oak and fir, amongst others, would be used. The Riparian Zone would be planted with trees and shrubs placed approximately 5 feet above low flow water surface elevation. Plants such as dogwood, redwood, firs, snowberry, oaks, rose and buckeyes, amongst others, would be used.

4.3 ALTERATIVE 2A: LARGE NOTCH

Alternative 2A was intended to remove the majority of the dam to provide for a floodplain terrace through the dam. The total channel width would be 32 foot and it was believed that this would allow for a 9-foot floodplain terrace. However, geotechnical slope stability constraints and the 1:5:1 side slope requirement minimized the allowable floodplain terrace to only 1.5 foot. Additionally, vegetated riprap would be necessary to protect the embankment from erosion and the vegetated riprap would completely bury the 1.5 bench.

Due to the constraints mentioned above, Alternatives 2A and 2B became almost identical in design. Additionally, as will be shown in section 4.8 Alternative Benefits and section 4.9 Alternative Costs, .Alternative 2A is expected to more costly while providing the same level of ecological outputs as Alternative 2B.

Due to the above, Alternative 2A has been dropped for further analysis. Sections 4.8 and 4.9 will include costs and benefits for Alternative 2A.

4.4 ALTERATIVE 2B: SMALL NOTCH

4.4.1 SUMMARY OF ALTERNATIVE 2B

Conceptually, Alternative 2B was designed to provide aquatic passage for the 1% storm event and to remove the least amount of the dam based on the early assumption that this could provide for higher levels of slope stability with the fewest geotechnical measures in place. Alternative 2B would provide for a total channel width of 23 feet. Because the determined width for the restored creek is 23 feet, this alternative does not allow for a floodplain bench.

In general, Alternative 2B includes the following: (1) removal of approximately 72% of the earthen dam structure; (2) backfilling the spillway with dam material for stabilization; (3) removal of approximately 95% of the accumulated sediment from behind the dam; (4) construction and restoration of York Creek from just below the dam to just above the sediment basin with a slope of approximately 5%; (5) restoration of roughly 3 acres of aquatic and riparian habitat with native vegetation and; (6) use of native plants for erosion control and site stabilization.

Alternative 2B is the geotechnically favored alternative as this alternative appears to be the most stable of all alternatives.

4.4.2 DETAILED DESCRIPTION OF ALTERNATIVE 2B

4.4.2.1 Removal of Dam and Drainpipe; Filling of Spillway

Alternative 2B provides for the minimal hydrologic passageway to handle 1% storm event in order to maximize the slope stability.

Alternative 2B includes the removal of approximately 72% percent of the earthen dam (11,777 cubic yards of material), the removal of the 6-foot diameter steel riser pipe and trash rack, and the spillway being filled with dam material.

Table 4.5. Alternative 2B: Quantity of Dam and Sediment Removal.

Alternative 2B: Estimated Dam and Sediment Removal Quantity in cubic yards	
Reach 1: Downstream Sediment	830
Reach 2: Dam Material	11,777
Reach 3: Reservoir Sediment	26,637
Total	39,244

4.4.2.2 Accumulated Sediment Removal

As seen in Table 4.5, it is estimated that 26,637 cubic yards of sediment will need to be removed for this alternative.

4.4.2.3 York Creek Channel Restoration:

The channel restoration design for this alternative is similar to the description for Alternative 1.

4.4.2.4 Revegetation

The revegetation plan for Alternative 2B is similar to the description for Alternative 1. The primary difference in the revegetation plan for Alternative 1 is that it allows for a floodplain terrace that would be planted with native vegetation while Alternative 2B does not allow for a terrace. Specifically, Alternative 2B would have 0.4 acres of Bank Zone, 0.5 acres of Terrace Zone and 1.1 acres of Riparian Zone. This totals 2.0 acres of restored habitat acreage.

4.5 ALTERNATIVE 3: FISH LADDER

4.5.1 SUMMARY OF ALTERNATIVE 3

Alternative 3 is designed to notch the dam as necessary to construct a concrete fish ladder through the notch and over the dam. The suggested fish ladder is a step-pool/weir design through the existing dam site.

In general, Alternative 3 includes the following: (1) notching the dam as necessary to construct a concrete fish ladder through the notch and over the dam; (2) removal of approximately 52% of the earthen dam structure; (3) backfilling the spillway with dam material for stabilization; (4) removal of approximately 37% of the accumulated sediment from behind the dam; (5) construction and restoration of York Creek from above the dam and fish latter upstream through the lowered sediment basin; (6) restoration of roughly 3 acres of aquatic and riparian habitat with native vegetation and; (7) use of native plants for erosion control and site stabilization.

4.5.2 DETAILED DESCRIPTION OF ALTERNATIVE 3

4.5.2.1 Notching of Dam; Removal of Drainpipe; Filling of Spillway

This alternative was developed as a method to reduce the extent of dam removal. Alternatives 1 and 2B require partial or complete of the dam to the elevation of the original streambed. Under this alternative dam removal would be less extensive. A section of the dam would be lowered approximately 20 feet. A fish ladder would then be constructed on the remaining face of the dam and would tie in to the creek upstream of the dam site.

The advantage of this alternative is that it reduces the volume of material to be removed and there is less concern of dam slope stability. The main disadvantage of this alternative is that fish ladders for this application are less reliable for fish passage and require more maintenance than a creek at its natural stream bed elevation. This will be discussed in detail below.

Specifically, Alternative 3 includes the lowering of the dam by removing approximately 52% of the earthen dam (8,831 cubic yards of material), the removal of the 6-foot diameter steel riser pipe and trash rack, and filling the spillway with dam material that would be removed to form the notch.

Table 4.6: Alternative 3: Quantity of Dam and Sediment Removal.

Alternative 3: Estimated Dam and Sediment Removal Quantity in cubic yards	
Reach 1: Downstream Sediment	969
Reach 2: Dam Material	8,431
Reach 3: Reservoir Sediment	10,372
Total	19,772

4.5.2.2 Design of Fish Ladder

The suggested fish ladder for this project site is a step-pool/weir design through the existing dam site. This type of ladder was chosen after reviewing all types and different configurations of fish ladder designs presented in several publications produced by various state agencies. This ladder would be made entirely of concrete to avoid sediment contributions from the sides of the dam. The only source of sediment is expected to come from upstream sources. A Denil-type ladder was not considered due to the high slope on which it would have to be constructed and the possible cost associated with such a structure. The dimensions for the ladder are as follows.

The width of each step in the fish ladder structure is 23 feet, which is also the width of the upstream portion of the creek. The actual width of the box in each step is 4 feet. It is 5 feet long and 20 inches high. The corners in the back of the box should be rounded so that a dead zone of inactivity is not established in each pool. The opening of the box is 1.5 feet wide and has a notch that extends down18 inches. The expected jump height between each box, with water, is 12 inches or less.

Construction of this fish ladder would use cast-in-place reinforced concrete to form the steps. First, footing for the concrete would be constructed, after which wall forms would be assembled using aluminum or wood. Once this is done, steel rebar would be installed to serve as reinforcement for the concrete. With the wall forms and reinforcement in place, concrete would be placed into all wall forms simultaneously and allowed to cure. Once the concrete has hardened, the forms would be removed.

The structure would be built into a 23% slope through the site. The structure is expected to pass all flows and has been designed to best accommodate passage of all lifestages of steelhead. From October to late April, the creek is expected to be concentrated to flowing into the boxes (it would pass through a weir into the first box at the top of the structure). In summer, the ladder would be essentially dry. Unlike a large-scale hydroelectric dam that always have (1) a functioning reservoir behind it; (2) consistent flow rates; (3) consistent velocities and (4) attraction flows, a fish ladder on York Creek cannot guarantee any of these factors. Flow rates are expected to change into and through the ladder depending on the time of year and thus the flow rate of York Creek.

The upstream and downstream portions of the creek from the fish ladder would have the same dimensions and design features as the full dam removal and notch alternatives. The profile upstream of the fish ladder would be 3% instead of 5%. As such, velocities approaching the ladder are expected to be slightly reduced due to the more gradual slope. Routine maintenance for this structure would be required to ensure fish passage.

4.5.2.3 Maintenance of the Fish Ladder

Fish ladders tend to accumulate debris and sediment and require significant, regular maintenance in order to keep them operable for fish passage. Based on maintenance records from the city of St. Helena, approximately 16,000 cubic yards of sediment was transported by York Creek and deposited behind the dam since 1992. This averages to approximately 1,300 cubic yards per year. Much of this material includes cobble, boulders, and woody debris that could potentially clog the fish ladder and would need to be removed prior to high flows as well as during and after each storm event.

Currently, there is a fish ladder located on Sulphur Springs Creek, a neighboring creek to York Creek. According to a memorandum from Lt. Don Richardson of the California Department of Fish and Game, there have been several maintenance issues with this fish ladder. The Sulphur Spring Creek consistently requires maintenance. Each year it plugs with sticks, leaves, rocks, and other in-stream items. It must be unplugged after every significant storm and the degree of blockage seems to vary with the size of the storm and timing (early storms cause more blockages). Some rocks are pounded in by the hydraulic action of water to the degree that they can only be removed with the use of an iron digging bar. In some cases the rocks are simply left in place which further reduces the effectiveness. This maintenance currently causes a drain on personnel and fish passage is blocked until someone clears the blockage after a storm event (DFG, 2005).

According to a consensus met during a meeting with the DFG, Corps, and the NRCS in April 2006, minimal maintenance for a fish ladder on York Creek would likely include the following: (1) an annual pre-storm season clearing of the fish ladders and weir pools. This could require several personnel, the use of picks and shovels, as well as a backhoe and dump truck for fallen trees and/or large boulders. (2) during the storm season, weekly checks and/or clearing of debris and sediment from the fish ladder. (3) following each storm, the ladder should also be cleared of debris and sediment. Due to the amount and size of the sediment particles in the watershed, this could include several personnel, use of picks and shovels and, potentially, the use of a backhoe and dump truck for large trees and/or boulders.

4.5.2.4 Fish Passage

In general, fish ladders are known to provide aquatic passage for a narrow selection of species and age cohort of that particular species. They are designed for anadromous aquatic species and tend to not be a successful tool for the migration of mobile populations of fish and aquatic species.

For this project alternative, all available criteria pertaining to velocities, jump heights, etc., has been incorporated into the fish ladder design. The boxes within the ladder have been designed such that jump height from each pool (box) does not exceed 12 inches.

Unlike a large-scale hydroelectric dam that always has a functioning reservoir providing consistent flow rates, consistent velocities and the possibility for attraction flows, York Creek reservoir has essentially no capacity and is subject to seasonal variation. Flow rates through the dam would depend on the natural flow rate of York Creek. From October to late April, the creek is expected to be concentrated to flowing into the boxes (it would pass through a weir into the first box at the top of the structure). In summer, the ladder would be essentially dry. Since water flow in York Creek tends to vary seasonally, it may significantly affect the operability of a fish ladder such that it would pass fish only during the rainy season (approximately December through April) or possibly large storm events.

4.5.2.5 Accumulated Sediment Removal

As seen in Table 4.6, the estimated amount of accumulated sediment to be removed from behind the dam and fish ladder would be 10,372 cubic yards, or approximately 37% of the total sediment. For more information on the construction aspects of sediment removal, please refer to the information for Alternative 1 or to the information provide in Section 4.0 for the alternative.

4.5.2.6 Channel Restoration

The channel restoration for Alternative 3 would be slightly different than for the previously described alternatives in that the naturally restored channel would start at the top of the dam notch and fish ladder and extend upstream though the sediment basin. The constructed channel would not be built within the natural channel bed. Instead, the sediment behind the dam would be stabilized in order for a more natural creek to feed into the top of the fish ladder. Specifically, the channel would be constructed 10-12 feet above the original channel bed.

4.5.2.7 Revegetation

Revegetation for Alternative 3 is generally similar to the revegetation described for the other action alternatives. However, specific design differences result in a slightly varied revegetation plan for this alternative.

The fish ladder would be a concrete structure built over a lowered dam. It would connect York Creek above the dam with York Creek below the dam. Through the sediment basin, a channel, similar to the channels for the other action alternatives would be constructed within the remaining sediment basin. Bank Zone vegetation would be used on the channel slopes and the remaining sediment would be planted as a Terrace Zone, as done for Alternative 1. As Alternative 3 requires the removal of some sediment, the slopes created by sediment removal would be planted with the trees and shrubs mentioned for the Riparian Zone in Alternative 1. Specifically, Alternative 3 would have 0.4 acres of Bank Zone, 0.9 acres of Terrace Zone and 0.6 acres of Riparian Zone. This totals 1.9 acres of restored habitat acreage.

4.6 EVALUATION OF ALTERNATIVE PLANS

The evaluation of the alternatives allows assessment and appraisal of the effects of the with project conditions of each alternative, and comparison to the future without project conditions. The criteria evaluated in this section have been determined to be the most important to the evaluation of the alternatives. The criteria are separated into four primary considerations: (1) sediment transport including the threat for an accidental accumulated sediment release, downstream riverine deposition, and downstream flooding; (2) slope stability; and (3) environmental resources, including vegetation resources, fisheries and aquatic resources, wildlife resources, cultural resources and aesthetics.

4.6.1 SEDIMENT TRANSPORT

4.6.1.1 Accumulated Sediment Deposition and Accidental Detrimental Downstream Releases

No Action Alternative

If the dam is not removed, most of the sediment carried by York Creek upstream of the dam would likely continue to accumulate around the drain pipe in the reservoir area, much as it has done in the past. Additionally, according to the City's engineers, the 2005-2006 storm season resulted in the expected sedimentation within the reservoir as well as additional sedimentation above the project site in York Creek channel. It is therefore likely that sedimentation would continue in the reservoir as well as upstream of the reservoir in York Creek.

As mentioned previously, on July 28, 1992, during routine maintenance of the reservoir outlet, there was an accidental sediment discharge downstream of the dam. This significant release resulted in a silt discharge "within the stream bed from the face of the dam to a point where the Napa River joins the stream" (DFG, July, 1992). The total distance of impact was approximately 2.5 to 3 miles long. The depth of the silt deposits varied from heavy deposits (up to 18 inches) just below the dam and continuing downstream for about 0.5 miles, gradually thinning until only a light covering of fine silt was deposited a the confluence with the Napa river (DFG, July 1992; DFG Aug 1992).

No action will likely result in a future sediment accumulation in the sediment basin and upstream of the project area. This sediment could lead to a future downstream catastrophic sediment release. It is also possible, like with all historical dams, that this 100-year old dam could fail in the future, which could cause catastrophic sediment releases. This latter possibility has not been further evaluated.


Figure 4.2. Sediment Accumulation. Much from 2005-2006 Storm Season

Alternatives 1 and 2B:

Alternatives 1 and 2B would remove 95-100% of the accumulated sediment behind the dam. In addition, these alternatives provide for a natural hydrologic and sediment transport through the dam site. Unlike the existing condition, where the dam acts as a sediment trap, the stream design for Alternatives 1 and 2B is expected to transport all sediment downstream. Therefore, these alternatives eliminate the threat of a detrimental downstream sediment release.

There are two possible sediment deposition areas on the project site within the channel and these areas may fill in over time and eventually match the 5% profile in the rest of the project area (the slopes in these areas is less than 1%). This is not expected to increase the risk for sudden sediment releases downstream.

Alternative 3:

Alternative 3 would provide for the removal of 37% of the accumulated sediment and the remaining sediment would be covered with a naturally restored creek or restored with native vegetation. The fish ladder would be made entirely of concrete to avoid sediment contributions from the sides of the dam. The only source of sediment is expected to come from upstream sources and are expected to flow through the ladder much as they would through the full removal and notch alternatives.

The profile of the fish ladder would be 3% instead of 5% for other action alternatives. As such, velocities approaching the ladder are expected to be slightly reduced due to the more gradual slope. This decrease in velocity through the project site could lead to future sediment deposition upstream of the dam. Deposition is expected to reach equilibrium and is not expected to cause detrimental sediment releases downstream.

The ladder's box weirs would trap some of the downstream flowing sediment and debris and would require routine maintenance in order to keep it unplugged and functional for fish passage. These costs have been incorporated into the operations and maintenance costs for this alternative and is described in more detail in section 4.6.3.2.

4.6.1.2 Downstream Sedimentation and Flooding

No Action Alternative

The dam acts as a barrier for much of the sediment that is transported from higher reaches of the watershed. Since its construction, it has captured approximately 1,000-10,000 cubic yards of sediment, annually. The No Action Alternative will likely result in an continued blockages for sediment transport and it is expected that this sediment will continue to accumulate behind the dam.

The reservoir does not provide flood protection downstream. The current reservoir provides a very minor capacity for storage. This storage produces a minor delay for downstream flows in small storm events. Once the standpipe is overwhelmed and/or plugged, the reservoir fills until the water level reaches the spillway. At this point, the flows into the reservoir are the same as the flows out of the reservoir; there is no longer a downstream flow difference.

Although the dam is over 100-years old, there has not been a dam-failure investigation done at this project site. If the dam is left in place, a future unforeseen dam failure could cause flood damages downstream.

Alternatives 1 and 2B

Sediment deposition on alluvial fans (valley bottoms) is a natural process and York Creek velocities decrease towards its confluence with the Napa River. Alternatives 1 and 2B would remove or modify the dam that currently blocks natural sediment transport to downstream reaches of York Creek and allow for natural sediment transport thought the project site.

The removal or Upper York Creek dam would allow sediment to be naturally transported downstream to the Napa Valley reach of York Creek. The majority of the sediment will be transported to the Napa River. However, significant percentages (10-20%) of the sediment could be deposited on the bottom of York Creek in the Napa Valley Reach.

The Corps is aware that additional sediment on the channel bottom will decrease channel capacity. This reduction in channel capacity is currently not expected to increase flood duration or flood depth when compared to the existing condition. A more thorough analysis of floodplain depths and flood duration for existing conditions and project conditions will be completed for final design. Modifications to project design and operations and maintenance will be made to minimize any impact.

4.6.2 SLOPE STABILITY

The existing condition could be impacted by future construction when the Selected Alternative is implemented. The highly erosive hillside could experience further landslide if nothing is done to stabilize that area. With the project in place, the possibility of landslide would be lessened as measures to address this unstable ground are implemented.

Geotechnical analysis was done to evaluate the slope stability concerns associated with each of the project alternatives. The geotechnical evaluation was also done to differentiate the alternatives in terms of ground response to excavation and stabilization measures.

For more information, please refer to Appendix C: Geotechnical Engineering.

No Action Alternative

The future without project conditions for topography, geology, and soils are expected to remain relatively unchanged for the foreseeable future. It is believed that the dam provides limited lateral support to the spillway and Spring Mountain Road, which in turn tends to minimize ground movement in the area. However, the build up of trapped sediments upstream of the dam could cause increased lateral earth pressures to the upstream face of the dam that may result to instability of the downstream slope, overtopping of the dam and accidental releases of sediments during high storm events.

Alternative 1

Geotechnical analysis has determined that Alternative 1 requires the highest level of reinforcement measures for the long term structural stability. Results from the geotechnical modeling of lateral deformation indicate excessive deformation on the order of at least 29 inches. This magnitude of deformation could trigger the instability of the excavated slope and the area east of the dam. While this deformation seems excessive it was based on a conservative assumption of design strengths that took into account unknown factors such the presence of sheared zone that are not readily apparent from laboratory testing of intact samples.

Current analysis has shown that Alternative 1 would require 3 rows of 11 reinforcing screw anchor nails (geotechnical slope stability tools) placed through the dam site. These screw anchor nails would be installed 50 to 100 feet into the ground based on their starting position. The actual number of rows of anchors will be determined upon completion of the final investigation and design

Alternative 2B

Alternative 2B is the preferred geotechnical solution for reducing or removing barriers to fish passage and at the same time for maintaining a stable road. Under this alternative the spillway would remain in place and backfilled to provide continued support for the existing road. The actual size of the notch would be based on further geotechnical analysis that would be done during the Design and Implementation Phase for construction.

Current analysis has shown that Alternative 2 would require 2 rows of 11 reinforcing screw anchor nails (geotechnical slope stability tools) placed through the dam site. These screw anchor nails would be installed 50 to 100 feet into the ground based on their starting position. The actual number of rows of anchors will be determined upon completion of the final investigation and design. A monitoring program consisting of geotechnical data from readings of piezometers and inclinometers must be incorporated in the design process to quantify the actual ground movement and stability at the site.

Alternative 3

The concrete fish ladder would be built over a lowered Upper York Creek Dam. It is not expected that this alternative would change the level of stability from the No Action alternative. Therefore no geotechnical modeling was done for this alternative.

4.6.3 ENVIRONMENTAL RESOURCES

4.6.3 1 Vegetation Resources

No Action Alternative

The project site comprises an area of approximately 0.05 acre of riparian habitat, including both banks of the stream. Historically, the project site had riparian habitat along the stream corridor and upland savanna. That habitat has been degraded by construction of the dam, operational errors and neglect, contributing to a large influx of sediment, which has had negative impacts on project site habitat and water quality. Continued disturbance of the sediment inhibits woody native vegetation and favors weedy exotic vegetation. Lack of tree canopy shade increases the temperature of the stream. There are approximately 22 large trees on the project site. Without project conditions, these trees would remain in place.

Without the project, conditions are expected to remain the same.

Alternative 1

Alternative 1 would restore 0.4 acres of Bank Zone, 0.6 acres of Terrace Zone and 1.2 acres of Riparian Zone. This would total 2.2 acres of habitat acreage.

The primary difference in the revegetation plan for Alternative 1 is that it allows for a floodplain terrace that would be planted with native vegetation while in Alternatives 2B and 3 do not allow for a terrace.

Alternative 1 would require the removal of approximately 22 large trees. More specifically, approximately 9 trees measuring 20 diameters at breast height (dbh), 8 trees measuring 30 dbh or less, and 5 measuring greater than 30 dbh would need to be removed. The largest tree to be removed is 78dbh that will need to be removed.

For all alternatives, approximately 475 medium and large tree species will be planted as specified in the Replanting Plan. Specifically, 23 maple, 15 box elder, 15 Oregon ash, 26 coast redwood, 152 tanbark oak, 36 douglas fir, 23 valley oak, 21 California bay laurel, 21 madrone and 144 coast live oak would be planted.

Alternative 2B

Revegetation for Alternative 2B is similar to the description for Alternative 1. Specifically, Alternative 2B would have 0.4 acres of Bank Zone, 0.5 acres of Terrace Zone and 1.1 acres of Riparian Zone. This totals 2.0 acres of restored habitat acreage.

Alternative 2B would require the removal of approximately 20 large trees. More specifically, approximately 8 trees measuring 20dbh, 7 trees measuring 30 dbh or less, and 5 measuring greater than 30 dbh would need to be removed. The largest tree to be removed is 78dbh that will need to be removed.

For all alternatives, approximately 475 medium and large tree species will be planted as specified in the Replanting Plan. Specifically, 23 maple, 15 box elder, 15 Oregon ash, 26 coast redwood, 152 tanbark oak, 36 douglas fir, 23 valley oak, 21 California bay laurel, 21 madrone and 144 coast live oak would be planted.

Alternative 3

Revegetation for Alternative 3 is generally similar to the revegetation described for the other action alternatives. However, specific design differences result in slight variations.

The fish ladder would be a concrete structure built over a lowered dam. It would connect York Creek above the dam with York Creek below the dam. Through the sediment basin, a channel, similar to the channels for the other action alternatives would be constructed within the remaining sediment basin. Bank Zone vegetation would be used on the channel slopes and the remaining sediment would be planted as a Terrace Zone, as done for Alternative 1. As Alternative 3 requires the removal of some sediment, the slopes created by sediment removal would be planted with the trees and shrubs mentioned for the Riparian Zone in Alternative 1. Specifically, Alternative 3 would have 0.4 acres of Bank Zone, 0.9 acres of Terrace Zone and 0.6 acres of Riparian Zone. This totals 1.9 acres of restored habitat acreage.

Alternative 3 would require the removal of approximately 21 large trees. More specifically, approximately 8 trees measuring 20dbh, 8 trees measuring 30 dbh or less, and 5 measuring greater than 30 dbh would need to be removed. The largest tree to be removed is 78 dbh that will need to be removed.

For all alternatives, approximately 475 medium and large tree species will be planted as specified in the Replanting Plan. Specifically, 23 maple, 15 box elder, 15 Oregon ash, 26 coast redwood, 152 tanbark oak, 36 douglas fir, 23 valley oak, 21 California bay laurel, 21 madrone and 144 coast live oak would be planted.

4.6.3.2 Fisheries and Aquatic Wildlife

In 2005, the NCRCD conducted a systematic habitat assessment of York Creek. The report concludes that the upper reach of York Creek offers excellent rearing and spawning habitat for steelhead, and that measures to allow access would greatly benefit the overall steelhead population. Nearly all potential steelhead spawning areas were considered suitable, and temperature monitoring indicates suitable conditions for steelhead.

No Action Alternative

The existing dam and reservoir blocks fish passage to spawning habitat for the federally listed CCC steelhead. The dam will continue to act as a barrier to sediment transport, sediment will continue to accumulate, and the threat of downstream sediment releases and fish kills will persist. Additionally, the presence of the dam and sediment basin creates an unnatural aquatic and riparian dispersal and migration barrier to native species.

Alternative 1

Alternative 1 includes the complete removal of the dam and looking upstream, includes the removal of the right wall of the spillway. Alternative 1 removes the barrier to aquatic and fisheries dispersal, allowing separate populations to move more readily upstream and downstream.

The removal of the dam and the construction of an engineered channel would result in three specific sources of habitat benefit to steelhead and other aquatic wildlife including: (1) restored aquatic habitat through the project site; (2) access to approximately 2 miles of spawning and rearing habitat above the project site, (3) elimination of the threat of downstream habitat destruction via uncontrolled sediment releases, and (4) provides aquatic habitat connectivity for fish and aquatic wildlife species populations through the project site.

Table 4.7.shows the amount of aquatic habitat that is currently available upstream of the project area, but isolated from steelhead populations by the dam. It also shows the amount of aquatic habitat that would be engineered through the project site. The sum of these values is “Total Aquatic Habitat” and includes the total aquatic habitat from the base of the dam, through the project site and to the uppermost reach of steelhead habitat on York Creek. Alternative 1and 2B would provide for 64,440 square feet (1.2 acres) or spawning and rearing habitat for steelhead.

Table 4.7. Aquatic Habitat Types.

	Existing Aquatic Habitat Upstream of Project Site (sq ft)	Alt 1 and 2B Project Site Future Aquatic Habitat (sq ft)	Total Aquatic Habitat (sq ft)	Total Aquatic Habitat (acres)
Pool Habitat	11,053	2,100	13,153	0.30
Flatwater Habitat	13,016	1,281	14,297	0.33
Riffle Habitat	34,705	2,289	36,994	0.58
TOTAL HABITAT	**58,774**	**5,670**	**64,444**	**1.21**

Table 4.8 shows the total length of stream that is currently available upstream of the project area, but currently isolated from steelhead populations by the dam. It also shows creek length that would be engineered through the project site. The total length of aquatic habitat would be from the base of the dam to the uppermost reach of steelhead habitat on York Creek. Because the project area below the dam is already reachable by steelhead populations, it has not been included in the below figures.

Table 4.8. Length of Aquatic Habitat.

Length of Reconnected Aquatic Habitat (ft)	Length of Restored Project Area Habitat (ft)	Total Length of Aquatic Habitat (ft)	Total Length of Aquatic Habitat (Miles)
8,030	825	8855	1.7

Alternative 1 is different from Alternative 2B in that it provides for a total dam removal width of 53 feet, including a 30 foot wide and 50 foot long floodplain terrace through the dam site. Although floodplain terraces are not common in the upper portions of this watershed, the historical presence of the reservoir has resulted in the widening of an otherwise narrow riparian corridor. Alternative 1 uses this reservoir area as an opportunity to provide additional riparian habitat to upland wildlife.

The floodplain terrace would be planted with native vegetation. The presence of this vegetation is expected to provide for a future riparian cover through the dam site and could provide future shading and habitat cover for steelhead.

Alternative 2B

Alternative 2B provides the same benefits to aquatic and fisheries resources as Alternative 1. The primary difference between Alternative 2B and Alternative 1 is that it does not provide for a floodplain terrace or riparian planting area through the dam site. This quantifies to 1,150 square feet less of restored riparian habitat and shading and 0.1 acres less of upland riparian habitat than Alternative 1.

Alternative 3

A fish ladder ideally maintained and cleared throughout the storm season and had that would have adequate flows during the steelhead migratory windows would be expected to provide for similar upstream steelhead passage as Alternatives 1 and 2B. However, as previously mentioned, it is unlikely that a fish ladder on York Creek would function in this way. The levels of uncertainty are higher, and the likelihood of functional success is lower.

Although there is no scientific literature that specifically compares the effectiveness of steelhead passage through a fish ladder versus a naturally engineered aquatic passage, there is a general acceptance by fish experts that a naturally restored creek would provide for more effective fish passage. A naturally engineered aquatic passage would more closely resemble a natural state when compared to a fish ladder and would be expected to provide aquatic passage for all species and lifestages. A fish ladder would not. Fish ladders are designed for specific species of migratory fish and tend to not be a successful tool for the migration and dispersal of other fish and aquatic species.

Additionally, unlike a large-scale hydroelectric dam that has a functioning reservoir behind it and a consistent flow rate, flows cannot be guaranteed or implemented at this site. Flow rates are expected to change through the ladder depending on the time of year and would be inconsistent. Flow fluctuation and natural sediment yields tend to accumulate debris and sediment and require significant, regular maintenance in order to keep them operable for fish passage. Figure 4.3 shows the sediment and debris accumulation from the 2005-2006 storm season.

Figure 4.3. Upper Reservoir during 2005-2006 Storm Season. Photo taken Spring 2006.

In order to quantify the difference in effectiveness between a fish ladder and a natural creek, a meeting was coordinated with fish experts from the DFG and the NCRCD and the San Francisco district's resident fisheries biologist, Peter LaCivita, in April 2006. Outputs from this meeting include a general understanding of the maintenance requirements of a fish ladder and estimated effectiveness percentages for steelhead passage through the fish ladder (Plan Form: Appendix L). As would be shown below, effectiveness of passage has been separated into adult upstream migration, smolt downstream migration, and local juvenile dispersion.

According to the consensus met during the April 2006 fisheries meeting, minimal maintenance for a fish ladder on York Creek would likely include the following: (1) an annual pre-storm season clearing of the fish ladders and weir pools. This could require several personnel, the use of picks and shovels, as well as a backhoe and dump truck for fallen trees and/or large boulders. (2) during the storm season, weekly checks and/or clearing of debris and sediment from the fish ladder. (3) following each storm, the ladder should also be cleared of debris and sediment. Due to the amount and size of the sediment particles in the watershed, this could include several personnel, use of picks and shovels and, potentially, the use of a backhoe and dump truck for large trees and/or boulders. For more specific information about the meeting, please refer to the Plan Formulation Appendix.

Assuming that the above maintenance is in place for the 50-year planning analysis period of this project, the meeting team then discussed the effectiveness of the fish ladder in comparison to an engineered channel. By assigning estimated effectiveness percentages to migration through the fish ladder, it would then be possible to calculate an estimate difference between Alternative 3 and the other action alternatives.

Please note that estimates are based on the best available information and knowledge of steelhead migration. Because there is a very high level of uncertainty with these estimates, the team only felt confident assigning a broad range percentage to the possible effectiveness.

For comparison purposes, it is estimated that a naturally engineered stream through the project site would provide 100% effectiveness for migrating steelhead. This includes upstream migrating adult steelhead, downstream migrating smolts, and also local migration and dispersal in York Creek.

Fish ladder blockages are expected to lower the effectiveness of the fish ladder for fish passage. Although exact estimates are unknown, it is expected that during each storm, the fish ladder would become impassible until the ladder is cleared.

NCRCD operates a stream gaging station on York Creek at HWY29, for the City of St. Helena. The gage was installed in Dec 2005, and the data indicate that there were 13 "large" spikes in the stage record during the past rainy season. NCRCD preliminary estimates show that each of these 13 spikes could produce a lot of debris. Therefore, during this past rainy season, some or all of these 13 streamflow events could have clogged a fish ladder. Since 2005-2006 was an active rain year, it is presumed that in an average year, the fish ladder might become clogged up to 10 times in an average year. If only the largest flows produce enough debris, then estimates would expect 6-7 clogs this past year, and 4-5 in an average year. For the purposes of this report, 4-7 clogs in any given year would be used to evaluate fish passage, which is believed to be a conservative estimate.

The migration window for steelhead upstream migration is approximately 150 days. Of these 150 days, the fish ladder could potential clog 4-7 times in any given year. This could result in a loss of 2-7 days with each clog event depending on how long it takes to clear the fish ladder. Using these estimates, the fish ladder could block upstream migration 8-49 days each year, or 5-33% of all migration days could be lost. Therefore, these preliminary blockage estimates indicate that a fish ladder would provide for 65-95% effectiveness when compared to notching or removing the dam.

Table 4.9. Steelhead Migration Effectiveness through the Fish Ladder.**

	Migration Windows	Natural Migration Days	Migration Effectiveness (%)
Adult Upstream Migration*	December-April	150	65-95%

Smolt Downstream Migration**	January-May	150	80-90%
Local Juvenile Downstream Dispersal**	Year Round	365	100%

* Values calculated based on preliminary hydrological estimates by NCRCD
** Values estimated during April 2006 Fisheries Meeting (See appendix L: Plan Form)

The estimate for Adult Upstream Migration will also be used in Section 4.8 as a comparison tool for benefit quantification.

4.6.3.3 Riparian Wildlife

DWR's Environmental Services Office has carried out biological and cultural resource surveys in the vicinity of Upper York Creek Dam and the masonry diversion structure. These surveys included, but were not limited to, protocol surveys for red-legged frogs, California freshwater shrimp, northern spotted owls, and sensitive plant species. DWR then prepared an Initial Study, which provides a thorough consideration of special-status species.

The forest in the vicinity of the project site provides habitat for numerous wildlife species typical of the California Coast Ranges. Common mammals include black-tailed deer, coyote, bobcat, raccoon, and skunks. Birds include a variety of raptors and songbirds. During site visits to the Lower Diversion Structure Restoration Project, which, is located downstream of Upper York Creek Dam, DWR biologists observed red-tailed hawks, Cooper's hawks, turkey vultures, and juvenile great horned owls, among other bird species, in the vicinity of the Upper Reservoir.

The relatively cool, moist forest surrounding Upper York Creek Dam and Upper Reservoir also provides suitable habitat for banana slugs, observed during several site visits, and Pacific giant salamanders, indicated by the observation of one dead adult in York Creek, upstream from Upper Reservoir, on November 19, 2001. The Upper Reservoir and a scour hole at the base of the Upper York Creek Dam spillway contain numerous non-native bullfrogs. The signal crayfish is another non-native predator observed throughout York Creek and in the Upper Reservoir (ENTRIX 2002).

Riparian wildlife can currently migrate over and/or around the dam so the dam does not block land-based dispersal.

No Action Alternative

Without-project conditions for the Upper York Creek Dam are expected to remain relatively unchanged for the foreseeable future.

Alternative 1

Alternative 1 would provide approximately 2 acres of additional riparian habitat to local wildlife. Non-native vegetation would be removed throughout the entire project site and would be seeded and planted with native vegetation. This would provide additional riparian habitat to local wildlife.

Through the dam site, 0.1 acre (of the total 2 acres) planted with native vegetation would provide for the most natural riparian habitat through the dam site. Alternative 1 would not require vegetated riprap for erosion protection.

Alternative 2B

Wildlife resources are expected to be similar to those described for Alternative 1. The primary difference is that Alternative 2B does not provide for a floodplain terrace through the dam site and instead the right bank would be lined with vegetated riprap for erosion protection along the 50-linear feet of restored stream.

Alternative 3

The fish ladder is a concrete structure through the dam site. In this area, there are no benefits to land-based wildlife. Upstream of the dam site and in the sediment basin, the restored creek and adjacent habitat would be constructed similar to the description for the other action alternatives.

4.6.3.4 Cultural Resources

The San Francisco District consulted with the State Historic Preservation Officer in accordance with regulations at 36 CFR Part 800 implementing Section 106 (National Historic Preservation Act). This resulted in a consensus-based determination that the York Creek Upper Reservoir Dam and Lower Diversion Structure qualified as a historic property, citing architectural and engineering features that exhibit a local level of significance under the theme of community planning and development..

All Action Alternatives would have an adverse effect on the historic property. Typically, negative impacts to historic or archaeological properties are caused by new development that either disturbs or destroys the location of the property. The modification or removal of the Dam for purposes of restoring fish passage is different in that the impact to the historic property actually derives from a proposal that benefits the environment. Thus the proposed undertaking cannot avoid affecting the integrity of the historic property's design, feeling, and association.

The Corps, as the Federal agency responsible for meeting the Section 106 requirements, would continue consultation with the State Historic Preservation Officer (SHPO) to discuss the adverse impact and to offer a treatment plan (i.e. mitigation documentation) to resolve the adverse effects. The appropriate scope of the documentation (considering the nature and significance of the property) would be based upon results of SHPO consultation and views expressed by interested parties. Such documentation is often the last means of preserving the physical information about a historic property, so that future researchers would have access to valuable information that otherwise would have been lost.

No Action Alternative

Without-project conditions for the Upper Reservoir Dam are expected to remain relatively unchanged for the foreseeable future.

Alternative 1

Action Alternative 1 would produce the greatest adverse affect to the historic property by removing the entire dam, which would preclude the property from conveying its historical significance.

Consultation and a mitigation documentation would be used to resolve the adverse effects. The appropriate scope of the documentation will consider the nature and significance of the property and be based upon results of SHPO consultation and views expressed by interested parties.

Alternative 2B and 3

Action Alternative 2B would produce a degree of physical alteration to the historic property that would constitute an adverse effect by removing part of the dam, which would preclude the property from conveying its historical significance.

Consultation, mitigation, and documentation would be the same as that noted in Alternative 1.

4.6.3.5 Visual and Aesthetics

No Action Alternative

Without-project conditions for the Upper York Creek Dam are expected to remain relatively unchanged for the foreseeable future.

Alternative 1 and 2B

Alternatives 1 and 2B are expected to improve the overall aesthetics of the project site. Restoration would lead to the development of more natural riverine and riparian habitat.

More specifically, Alternative 1 would create the largest construction footprint but would also provide the greatest opportunity for riparian planting. Alternative 2B would allow for a slightly smaller opportunity for riparian planting and would require the installation of vegetated riprap for erosion protection. The vegetation would completely cover the riprap and the vegetated riprap would not be seen from the road.

There would be short-term visual impacts during construction of the proposed project due to the presence of construction equipment and the necessary removal of some vegetation at the project site. Specifically, earthmoving operations would be visible from the roadway along approximately 600 feet of Spring Mountain Road. However, this negative visual impact would not be significant, and the long-term impact of the project, after re-vegetation, would be positive because it would result in the project sites blending with the natural appearance of their surroundings.

Aesthetics would be an integral part of project design and would include a major revegetation effort using native plant species that blend with the natural surroundings. Cuts made by construction equipment would not be left with a machined or unnatural appearance and contour grading would blend with the natural topography. Site specific measures for erosion control would be utilized, including erosion control methods that blend with the natural surroundings. The project site would have clearly defined limits, and a row of trees would be left along much of the roadside to minimize the area that is visually impacted.

Alternative 3

The fish ladder alternative would involve excavating a short, V-shaped channel through the dam, about 10-feet deep, 30-to-60-feet wide at the top, 10-feet wide at the bottom, and 120-feet long. This is much less excavation than the other Action Alternatives, but there would still be eight V-notch weirs upstream of the remaining dam to account for the 10 feet of grade drop. Compared to the other alternatives, Alternative 3 would place a large concrete structure in the project site and is considered less aesthetically pleasing than the other alternatives, including the No Action Alternatives.

Given the substantial woody debris and sediment load, a ladder alternative would undoubtedly require an additional, perpetual maintenance cost, would be vulnerable to vandalism, and may require fencing to reduce human risk or vandalism. The reduced grade upstream of the finished ladder would remain more depositional than the other alternatives.

4.7 COMPARISON OF THE ALTERNATIVE PLANS

All of the action alternatives involve varying levels of dam modification, removal of dam material, removal of accumulated sediment material, revegetation of approximately 2 acres, and channel restoration. The final alternatives are differentiated by the portion of dam removed where Alternative 1 provides the greatest portion of dam removal, Alternative 2B provides for the removal of a "notch" through the dam, and Alternative 3 provides for the lowering of the dam and placement of a fish ladder over the remainder of the dam. Table 4.2: Details of Project Alternatives, shows these differences by showing the total dam and sediment material that would be removed.

4.7.1 FISH PASSAGE:

Reestablishment of fish passage upstream of Upper York Creek Dam is also common to all the action alternatives, where Alternatives 1 and 2B provide for a restored natural creek bed and Alternative 3 provides for a fish ladder aquatic passage over the lowered dam. For comparison purposes, it is estimated that alternatives 1 and 2B would provide 100% effectiveness for upstream migrating steelhead whereas Alternative 3 would provide for 65-95% effectiveness.

4.7.2 FUTURE DOWNSTREAM HABITAT DEGRADATION AND FISH KILLS:

From the perspective of accumulated sediment and the future threat of sediment release, all action alternatives provide for sediment removal. Alternatives 1and 2B provide for the removal of 95-100% of sediment and Alternative 3 provides for the removal of 37% of the sediment. The naturally restored creek for alternatives 1 and 2B also provides for the most natural sediment transport system in the future and thus eliminate the threat of an accidental accumulated sediment release.

Alternative 3 reduces the threat of accidental sediment releases but does not eliminate it. Alternative 3 would leave 63% of the total accumulated sediment behind the lowered dam.

4.7.3 HABITAT RESTORATION:

Riverine restoration in York Creek is most natural for Alternatives 1 and 2B. The primary difference between the action alternatives is that Alternatives 1 and 2B would be constructed, as feasible, to flow through the historical channel. Alternative 3 would be constructed from the top of the fish ladder (over the dam) and through the remaining sediment basin. For Alternative 3, the channel would be 10-12 feet above the original channel bed.

From the perspective of habitat restoration, all alternatives follow a single methodology for the revegetation of the project site. The project would provide for the revegetation of approximately 2 acres of disturbed area for all alternatives. The primary difference in the revegetation plan for Alternative 1 is that it allows for a floodplain terrace that would be planted with native vegetation, while Alternative 2B and Alternative 3 do not allow for a terrace. Floodplain terraces are not a natural feature to the upper York Creek watershed. However, the 100-year old reservoir has left an unnaturally wide open area at the project site and there was initial resource agency support for an increased floodplain terrace habitat through the project site. Alternative 1 provides this additional habitat whereas a cut slope with vegetated riprap would be necessary for the right-bank of Alternative 2B. Alternative 3 provides for the least amount of revegetation.

4.7.4 CONNECTIVITY

The removal and/or modification of Upper York Creek Dam will allow for a more natural hydrologic and sediment transport system. Of the 3 remaining alternatives, Alternatives 1 and 2B would provide for the most natural hydrologic and wildlife migration and dispersal corridor. These alternatives would allow fish and wildlife species to migrate and disperse though their historical aquatic and riparian habitat ranges.

4.7.5 COMPLETENESS

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. In general, the alternatives are all complete. Impacts resulting from the actions of dam modification, common to all the action alternatives were evaluated. No further measures are needed to allow for the functioning of the alternatives.

4.7.6 EFFECTIVENESS

Effectiveness is the extent to which an alternative plan alleviates the specified problems, achieves the specified opportunities, and satisfies constraints. Each of the alternatives is effective in addressing the problems and opportunities identified as part of this study, and all make significant contributions to the objectives, while satisfying constraints. The degree of effectiveness, however, varies for the ability of adult steelhead passage success and juvenile outmigrant success. Alternative 3 would provide for lower passage effectiveness when compared to a restored stream through the dam site. In addition, routine maintenance is necessary for this structure to remain effective as they tend to accumulate debris and sediment.

4.7.7 EFFICIENCY

Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation’s environment. The individual components or measures of an alternative were selected after careful consideration of alternate means, including costs, of accomplishing a similar goal.

4.6.8 ACCEPTABILITY

Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public and compatibility of existing laws, regulations, and public policies. Alternative 3 is the least acceptable alternative to the resource agencies involved with this project. The Corps has received letters from RWQCB, DFG, and NMFS expressing concern with the fish ladder. The major concerns are that the fish ladder alternative does not adequately eliminate the sediment discharge issues and would not be as effective for fish passage. The Corps PDT has worked closely with these agencies and has incorporated their comments into the analysis of Alternative 3.

Below, Tables 4.10 and 4.11 provide a summary of Environmental Quality Impacts, Regional Economic Development (RED), and Other Social Effects (OSE).

Table 4.10. Summary of Environmental Quality Impacts.

Alts	Environmental Quality Impacts									
	Air Quality Impacts	Cultural Resources Impacts	Downstream Sediment Impacts	Noise Impacts	Road Truck Traffic Impacts	Slope Stability Impacts	T&E Species Impacts	Turbidity	Vegetation Resources (acres revegetated)	Water Quality Impacts
No-Action	NA	NA	Low	NA	NA	NA	NA	NA	0	NA
1	Low Impact from Trucks and Large Equipment	Moderate: Structure would be removed.	Low: To be further investigated in Design	Low	Moderate	Low: To be further investigated in Design	Habitat Improved	Low	2.2	Low
2B	Low Impact from Trucks and Large Equipment	Moderate: Structure would be modified	Low: To be further investigated in Design	Low	Moderate	Low: To be further investigated in Design	Habitat Improved	Low	2	Low
3	Low Impact From Trucks And Large Equipment	Low: Historical Structure would be changed	Low: To be further investigated in Design	Low	Moderate	Low: To be further investigated in Design	Habitat Improved	Low	1.9	Low

Table 4.11. Summary of RED and OSE Outputs.

Alternative	Other Impacts		Regional Economic Development (RED)			Other Social Effects (OSE)		
	Constructability Risks	Hardening structures required	Benefit to Regional Industry	Aggregate Sale	Regional Construction Industry	Flood Risk	Aesthetics	Recreational Benefits
No-Action	NA	NA	NA	NA	NA	Low	NA	NA
1	Moderate: Geotechnical Stability measures necessary	NA	NA	NA	Temporary benefit	To be further investigated in Design.	Improved: More natural	NA
2B	Low	Vegetated Riprap required for erosion protection	NA	NA	Temporary benefit	To be further investigated in Design.	Improved: More natural	NA
3	Moderate	Cement Structure	NA	NA	Temporary benefit	Low	Lower: Concrete structure in stream path.	NA

4.8 ALTERNATIVE BENEFITS

The benefits associated with the alternatives have been calculated by combining current steelhead habitat availability with current trout population estimates. Together, this information allows for the calculation of the steelhead carrying capacity for Upper York Creek upstream of the dam. Below is a short explanation of how this estimate was developed. Details can be found in Appendix L: Plan Formulation.

For the purposes of this project, NCRCD assisted the Corps by combining habitat data for York Creek with current rainbow trout[3] density data to produce an estimated steelhead carrying capacity[4]. This produced an estimate for the number of steelhead that York Creek could support from the base of the dam, through the project site, and to the uppermost reach of York Creek. Estimates are based on rainbow trout populations in September 2005. Steelhead populations in September would primarily include steelhead that are 4-6 months old.

Habitat survey data collected in 2003 by NCRCD were compiled for the reaches above the Upper York Creek Dam to the end of potential steelhead habitat at a bedrock falls (NCRCD, 2005). These data were used to calculate usable habitat estimates for juvenile steelhead rearing. Steelhead densities calculated from electrofishing efforts by Stillwater Sciences (2005) were then assigned to each habitat category to estimate potential carrying capacity. Documentation from NCRCD can be found in Appendix L: Plan Formulation

The NCRCD habitat survey data was introduced in 4.6.3.2: Fisheries and Aquatic Wildlife and would be summarized for the purposes of this section. Below, Table 4.12 shows the total aquatic habitat that is available upstream of the dam, but currently isolated from steelhead migration and spawning by the dam.

Table 4.12. Total Aquatic Habitat Types.

	Total Aquatic Habitat (sq ft)	**Total Aquatic Habitat (acres)**
Pool Habitat	13,153	0.30
Flatwater Habitat	14,297	0.33
Riffle Habitat	36,994	0.58
TOTAL HABITAT	**64,444**	**1.21**

[3] **Rainbow trout**: Rainbow trout and steelhead are the same species of fish; the two names reflect two distinct life history patterns. The name rainbow trout is used for the non-anadromous life history. Rainbow trout do not leave the stream to go to the ocean. They spend their entire life in the stream. Anadromous forms of the trout can convert to resident populations when drought events or damming of rivers blocks their access to the ocean. Conversely, resident trout populations can become anadromous if ocean access becomes available (NCRCD, 2006). There is a rainbow trout population above Upper York Creek Dam.

[4] **Carrying capacity**: is defined as the "maximum population size of a species that an area can support without reducing its ability to support the same species in the future”.

Table 4.13 shows the total length of stream that is currently available upstream of the project area, but currently isolated from steelhead populations by the dam.

Table 4.13. Total Length of Aquatic Habitat.

	Total Length of Aquatic Habitat (ft)	Total Length of Aquatic Habitat (Miles)
Aquatic Habitat	8855	1.7

Table 4.14 shows the steelhead density estimate that was established with the Stillwater Sciences data. High and low density estimates represent the highest and lowest recorded value respectively. Moderate estimates are the average of the two.

Table 4.14. Steelhead Trout Densities in York Creek above the Project Site.

Steelhead Density (# of steelhead per square foot)			
Aquatic Habitat	**High**	**Moderate***	**Low**
Pool	0.053	0.0375	0.022
Flatwater	0.021	0.015	0.009
Riffle	0.022	0.0165	0.011

*calculated value

Table 4.15 shows the estimated steelhead carrying capacity upstream of Upper York Creek Dam, including the proposed length of restored creek channel in the Upper Reservoir area. The original NCRCD's estimates did not include habitat within the project area; they included only the habitat from above the sediment reservoir to the upper watershed. The below estimates have been adjusted to reflect the habitat that would be created if alternatives 1, 2A[5], 2B, or 3 were constructed. Steelhead densities calculated from the Stillwater Sciences efforts were low density estimates and represent the highest and lowest recorded value respectively. Moderate estimates are the average of the two.

[5] Although Alternative 2A was dropped from further consideration, it will be included in sections 3.15 and 3.16 so that the rationale for removing it from consideration is clear.

Table 4.15. Estimated Steelhead Carrying Capacity for Aquatic Habitat above Upper York Creek Dam.

ESTIMATED CARRYING CAPACITY			
	HIGH	MODERATE*	LOW
POOL	**697**	493	289
FLATWATER	**300**	214	129
RIFFLE	**814**	610	407
TOTAL STANDING CROP	**1,810**	1,320	825
STEELHEAD PER 100 ft.	**23**	16	10

*calculated value

NCRCD estimated that the upstream reaches could annually support between ~825 and ~1,810 juvenile steelhead given current habitat conditions. This does not account for other factors such as temperature, sediment, and predation that all may have an unknown effect on the upstream population. NCRCD, DFG, and the Corps are confident with the high estimates for short term estimation (5-10 years) as electrofishing results were conservative in comparison to density data on other creeks in the Napa River Watershed. This could be caused by several factors, including the presence of the Upper York Creek Dam. Sensitivity analysis for the range of carrying capacity showed is shown in Appendix L: Plan Formulation.

4.8.1 PROJECT BENEFIT QUANTIFICATION

Upstream benefits would be used to determine the number of steelhead that could potentially utilize the habitat upstream of the dam. For Alternatives 1, 2A and 2B, the ecosystem restoration benefits would equal the “High” estimates for the total standing crop of steelhead. This would be approximately 1,800.

Due to the difference in effectiveness described in section 4.6.3.2: Fisheries and Aquatic Wildlife, the fish ladder is expected to produce 65-95% of the total benefits as it’s effectiveness is only 65-95% when compared to alternatives 1, 2A, and 2B.

Below, Table 4.16 summarizes the upstream ecosystem restoration benefits for the project alternatives.

Table 4.16. Ecosystem Restoration Benefits

Alternative	Upstream Ecosystem Benefit Units		
	Potential Steelhead Carrying Capacity[6]	Percentage Effectiveness for Steelhead Passage	Total Ecosystem Benefits
No Action	1800	0%	0
1	1800	100%	1800
2A	1800	100%	1800
2B	1800	100%	1800
3	1800	65-95%	1205-1710

4.9 ALTERNATIVE COSTS

The project benefits and costs for each of the alternative are presented Table 4.17.

[6] The "high" carrying capacity estimate was used for the ecosystem benefit quantification based on feedback from DFG, NCRCD, and Peter LaCivita, Corps Fisheries Biologist. Please see section 3.3 Alternative Benefits for more information.

Table 4.17. Benefits and Costs (FY 2006 Price Levels)

Cost Items	Alt 1	Alt 2A	Alt 2B	Alt 3
Benefits				
Ecosystem Benefits	1810	1810	1810	1205-1710
LERRDs (Estimation based on 2005 preliminary estimate; To be updated in July 2006)				
Land Acquisition	$167,000	$167,000	$167,000	$167,000
Federal Administration costs	$93,500	$93,500	$93,500	$93,500
LERRDs Subtotal	**$260,500**	**$260,500**	**$260,500**	**$260,500**
Plans and Implementation Phase				
Geotech	$80,000	$80,000	$80,000	$80,000
Water Resources	$100,000	$100,000	$100,000	$100,000
Environmental Compliance	$50,000	$50,000	$50,000	$50,000
Other	$20,000	$20,000	$20,000	$20,000
P&I Phase Subtotal	**$250,000**	**$250,000**	**$250,000**	**$250,000**
Construction Phase				
Construction	$5,686,238	$4,900,400	$4,884,599	$4,055,384
Engineering During Construction	$150,000	$150,000	$150,000	$150,000
Supervision & Administration	$350,000	$350,000	$350,000	$350,000
Cultural Resources	$30,000	$30,000	$30,000	$30,000
Construction Phase Subtotal (inc. LERRDs and P&I)	*$6,726,738*	*$5,940,900*	*$5,925,099*	*$5,095,884*
Monitoring & Adaptive Management	$233,295	$219,405	$208,266	$211,120
TOTAL FIRST COST	$6,960,033	$6,160,305	$6,133,365	$5,307,004
Total Costs				
TOTAL FIRST COST	$6,960,033	$6,160,305	$6,133,365	$5,307,004
Interest during construction	$447,788	$385,903	$384,659	$319,959
TOTAL GROSS INVESTMENT	$7,407,821	$6,546,208	$6,518,024	$5,626,963
Total Cost of Maintenance (OMRR&R)	$1,037,258	$1,037,258	$1,037,258	$1,936,210
TOTAL COST	$8,445,079	$7,583,466	$7,555,282	$7,563,173
Annual Costs				
Annual Costs of Total Gross Investment	$484,891	$436,779	$435,205	$435,612
Annual Cost of Maintenance (OMRR&R)	$20,745	$20,745	$20,745	$38,724
Total Annual Costs (AAC)	$505,636	$457,524	$455,950	$474,336
Average Annual Cost per Ecosystem Benefit	**$268**	**$241**	**$240**	**$265-$362**

4.10 NATIONAL ECOSYSTEM RESTORATION PLAN

Alternative 2B is the National Ecosystem Restoration Plan as it is the most cost effective plan for the highest level of ecosystem restoration benefits. The Sponsor is supportive of the NER plan.

5.1 GENERAL

This Chapter presents information on the tentatively Recommended Plan. This includes descriptions of the major project features associated with construction of the project, real estate requirements, and operation and maintenance requirements. Information is also presented on project construction and maintenance costs, benefits of the project, and an economic analysis.

5.2 PLAN DESCRIPTION

In general, Alternative 2B includes the following: (1) removal of approximately 72% of the earthen dam structure; (2) backfilling the spillway with dam material for stabilization; (3) removal of approximately 95% of the accumulated sediment from behind the dam; (4) construction and restoration of York Creek from just below the dam to just above the sediment basin with a slope of approximately 5%; (5) restoration of roughly 3 acres of aquatic and riparian habitat with native vegetation and; (6) use of native plants for erosion control and site stabilization.

5.2.1 ACCUMULATED SEDIMENT REMOVAL, DISPOSAL, AND REUSE

As seen below in Table 5.1, the volume of material that would be removed has been separated into 3 reaches: Reach 1 is the material accumulated downstream of the dam; Reach 2 is the dam material; and Reach 3 is the reservoir sediment located behind the dam.

Table 5.1. Recommended Plan: Quantity of Dam and Sediment Removal

Estimated Dam and Sediment Removal Quantity in cubic yards	
Reach 1: Downstream Sediment	830
Reach 2: Dam Material	11,777
Reach 3: Reservoir Sediment	26,637
Total	39,244

Heavy earthmoving equipment would be used to remove the accumulated sediments. As seen in table 5.1, the estimated amount of accumulated sediment to be removed from behind the dam is 26,637 cubic yards.

Before the sediment material is hauled off for reuse or disposal, the material would be sorted, and materials necessary for restoration would be stockpiled. It is estimated that approximately 400 cubic yards of dam material is needed to recontour the channel. The sediment that is not reused onsite would need to be taken to a an offsite location.

5.2.1.1 Disposal and Reuse

There is an opportunity to beneficially reuse the project sediment and dam material at various locations. These opportunities include potential reuse at the City's lower reservoir. Other opportunities include reuse at private vineyards or for the City's flood control project at Fulton Lane. All beneficial reuse locations would be considered in the design and implementation phase.

For feasibility level analysis, two primary disposal sites were identified for the project's estimated 38,900 cubic yards or material. The first would utilize beneficial reuse and the second, a permitted landfill, would act as a backup, or guaranteed location for disposal.

Specifically, The first site is beneficial reuse at the City's Lower Reservoir. The second location is Clover Flat, a permitted landfill that is located within 9 miles of the project site. It is expected that 75% or the total project material (29,180 cubic yards) will be taken to the Lower Reservoir and 25% (9,730 cubic yards) will be taken to Clover Flat. Please note that these disposal options will be further analyzed during the Plans and Specifications Please see section 5.3.1 Dam and Sediment Disposal Location for information regarding the uncertainty relating to disposal options.

The Lower Reservoir is located approximately 1 mile downstream from the project site. Instead of disposal, the City is considering making its Lower Reservoir available for off-site reuse and storage of the project sediment. To accomplish this, the water surface elevation would be lowered, and fine sediments would be place on the exposed bank and graded to a stable configuration for long-term storage. It is estimated that storage of the fine sediments would require approximately 6-12 acre-feet, 3.5-7% of the reservoir's capacity.

The Lower Reservoir is considered a water of the U.S. and there is wetland vegetation on the edges of the lower reservoir. Appropriate permits and approvals will need to be acquired for utilization of the Lower Reservoir. There is currently agency support for this use.

Clover Flat is a permitted landfull that is located within 9 miles of the project site in the City of Calistoga. Project trucks would drive 2 miles from the upper reservoir along Spring Mountain Road and Madrona and then 6.5 miles to the Clover Flat landfill via Highway 29, Deer Park Road, and Silverado Trail.

5.2.2 DAM REMOVAL, DISPOSAL, AND REUSE

Heavy earthmoving equipment would be used to remove the dam material. As seen in Table 5.1, the estimated amount of dam material to be removed is 11,777 cubic yards.

5.2.2.1 Disposal and Reuse

The spillway would be filled and buried by using on-site materials from the dam structure to reduce the volume of dam material. Approximately 11,777 cubic yards of earthen dam sediment would need to be removed from the project site and would be taken to the Lower

Reservoir for eventual reuse by the City or to Clover Flats for disposal. Please see section 5.2.1.1 Accumulated Sediment Disposal for more detailed information.

Due to the presence of naturally occurring asbestos, there are restrictions placed on how the dam material can be used and disposed of. For the dam material, this means that there are limitations on how the material can be reused. Specifically, the dam material cannot be used for surfacing applications. To the extent possible, the dam material will be first used to fill the spillway and this material will be covered with acceptable surfacing material. For more information, please refer to section 5.4.8 HTW Considerations

5.2.3 YORK CREEK CHANNEL RESTORATION

The constructed channel would be approximately 23 feet wide and 5 feet deep. The proposed trapezoidal channel has either a 1.5H:1V (horizontal:vertical) or 2H:1V side slopes and would be designed to maintain a low-erosion flow velocity with approximately a 5.09% slope

Two specific channel restoration designs have been developed from these dimensions and parameters mentioned above:

- The first channel design (Channel Design 1) would be designed to include all features of a functioning creek. The design will include channel cross-sections, plan form, pools and riffles, channel slope and bottom material.

- The second channel design (Channel Design 2) would be limited to a basic cross-section, plan, slope, and bottom material. Pool and riffles would be allowed to form naturally over time within this cross-section. The basic cross-section will be similar to the riffle detail on Plate 7 of Appendix A: Hydrology and Hydraulics.

Currently, the project designs include Channel Design One. Specifically, this currently includes the design of pools, riffles, and runs in the channel. Currently, there are 4 pools, 5 riffles, and 1 run included in initial design. The riffles are designed to be approximately 64 feet long, the pools 105 feet long, and the run to be between 69 and 92 feet long. These features are preliminary. Pool and riffle lengths for this design have been designed to be longer than the existing representative reaches in York Creek as the high sediment load above the project area is expected to move downstream, creating its own equilibrium. Pools and riffles are expected to shorten until an equilibrium state is reached.

The actual channel design will be determined in the design phase. If Channel Design Two were selected, it would provide the recommended restoration cross-sections, plan and slope requirements while allowing for the natural formation of pools, riffles, and bars over time. There is an adequate supply of gravel to the restoration area. A simple cross-section set on the original channel combined with a reasonable meander plan should provide a good base for future channel evolution. It is likely that this method would be more cost effective and therefore will be further considered during the Plans and Specifications Phase.

Earthmoving equipment would be used for construction activities. Construction activities for Channel Design 2 would include recontouring the stream banks, placing rock for bed and bank stabilization, and placing boulders and trees for fish habitat structures. Channel restoration includes design features of pools, riffles, and runs in the channel design. Specifically, there are 4 pools, 5 riffles, and 1 run included in initial design. The riffles are designed to be approximately 64 feet long, the pools 105 feet long, and the run to be between 69 and 92 feet long. These features are preliminary. Pool and riffle lengths for this design are purposely longer than representative reaches in York Creek. There is adequate existing sediment in the upper watershed that is expected to move downstream and into the project area. This sediment load would allow the engineered creek to adapt to its own equilibrium over time. Pools and riffles are expected to shorten until an equilibrium state is reached. This allows for the most natural stream design and avoids over engineering the streambed.

5.2.3.1 Erosion Protection

Alternative 2A/2B includes a partial removal of the Upper York Creek Dam (also called the Notched Dam Alternative). The remaining dam embankment will be stabilized so that it would continue to support Spring Mountain Road. As part of maintaining slope stability the lower slope of the dam would be protected against erosion with vegetated riprap. Vegetation alone would not protect the embankment against calculated channel velocities of 13 ft/sec. If the toe is allowed to erode the geotechnical design safety factors would change and the road above could be subject to sliding.

The riprap design for this project is based on the DFG California Salmonid Stream Habitat Restoration Manuel, part Vii, Project Implementation, Boulder Riprap. The riprap would be placed on a 1V:1.5H slope. The height of the riprap above the proposed design channel bottom was determined by first calculating the 100-year water surface elevation. The design riprap elevation would be set 4.5 feet above the proposed channel invert.

Riprap sizing was determined using the HEC-RAS hydraulic computer model and in reference to riprap size requirements as outlined in EM 1110-2-1601 1 July 1991. Based on the above, the necessary rock size would be 42 inches. Existing site conditions indicate that the selected riprap size is reasonable. The sediment that is moving through the project area is in the 12 to 20 inch range. A lesser number of large boulders 30 inches across and greater are in the project areas.

Additional riprap would be required at the toe of the riprap slope to support the slope and to protect against scour. A toe trench as shown in Figure 5.1 would be constructed 3 feet below the planned channel bottom. Place riprap would be placed with soil and willow stakes. The riprap would be covered with vegetation. The filter behind the riprap would be constructed of geotechnical fabric reinforced with geogrid matting. The filter layer can also be constructed of rock and gravel if appropriate for vegetation, geotechnical stability and economical.

Below, Figure 5.1 shows a cross-section of the riprap design. For more information, please refer to the Hydrology and Hydraulics Appendix.

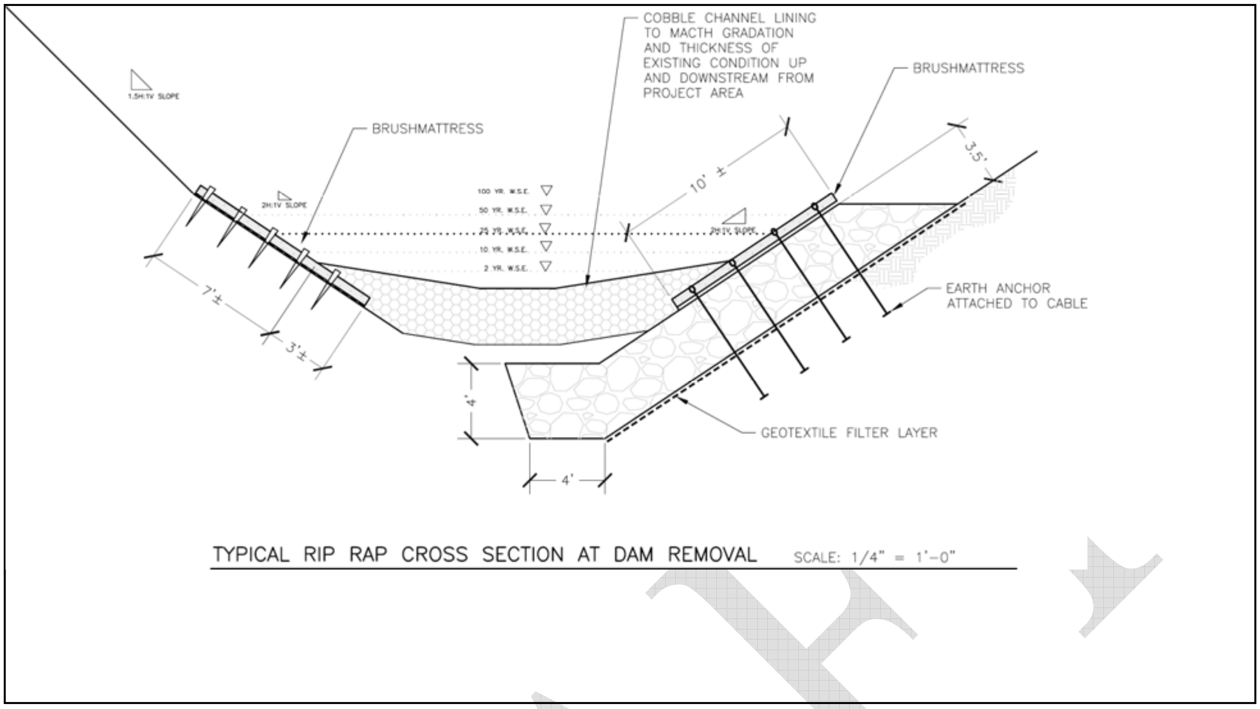


Figure 5.1 Riprap Design

5.2.3.2 Grade Control

Current design alternatives have not included plans for significant grade control. However grade control may be necessary for the following reason. During construction of the dam the York Creek's natural gravel streambed may have been removed to prevent seepage under the dam. Also there may have been disturbance to the creek upstream of the dam during construction. Current alternative designs have assumed that the original channel bed material wood still be in place and be available for the restored design. This may not be true therefore channel restoration may require grade control for the final restored channel bed. Grade control should be planned for however the required extent and locations will not be known until construction is under way and the proposed projects creek bed is exposed.

5.2.4 REVEGETATION

The project would require revegetation of roughly 2 acres of disturbed area for the recommended alternative. Revegetation would focus on creation of self-sustaining native vegetative habitat, control of erosion and stabilization of the newly created stream channel. For specific details, please refer to Appendix G: Habitat Revegetation Report.

Revegetation of the areas disturbed by construction would follow three vegetation types: Bank Zone, Terrace Zone, and Riparian Zone. These zones were based preliminary on hydraulic modeling to establish the elevations of the zones relative to the channel bed. These zones would be refined on the basis of further iterations of the detailed design of the selected project.

Specifically, revegetation would include 0.4 acres of Bank Zone, 0.5 acres of Terrace Zone, and 1.1 acres of Riparian Zone. This totals 2.0 acres of restored habitat acreage. The Bank Zone would be planted with emergent aquatic vegetation 0.5 to 3 feet above low flow water surface elevations. There would be 2 to 5 rows of plants, spaced 1 foot apart. Plants such as rush, sedge, wildrye, deergrass, willow and alder would be used. The Terrace Zone would be planted with woody plants placed 3 to 5 feet above the low flow water surface. Plants such as wildrye, deergrass, maple, elder, dogwood, buckeyes, oak and fir, amongst others, would be used. The Riparian Zone would be planted with tree and shrubs placed approximately 5 feet above low flow water surface elevation. Plants such as dogwood, redwood, firs, snowberry, oaks, rose and buckeyes, amongst others, would be used.

5.2.4.1 Revegetation Construction Phasing and Coordination

Revegetation activities would need to be coordinated with dam removal, slope stabilization structures, bank stabilization as well as erosion protection. Revegetation of surfaces exposed by removal of sediment in some areas could proceed prior to dam removal or other major construction to minimize erosion.

5.2.4.2 Revegetation Steps

As the areas exposed by sediment removal and channel-grading operations would likely not have a significant weed seed bank, it is important that revegetation efforts proceed as soon as possible after earthwork, thereby taking advantage of the relatively weed free starting condition and filling the vacuum with desirable native plants rather than exotic weedy species. If a phased approach to revegetation is taken, it is important that desirable erosion control grasses and forbes are seeded first to help crowd out weeds. Plants can be installed over one or two years, however higher costs would be associated with a two year installation.

5.2.4.3 Irrigation

Temporary irrigation during the planting installation and the following four-year maintenance period would be provided. The goal of the irrigation is to increase plant survival rates, growth rates and encourage deep plant rooting. This requires frequent watering in the first season, followed by increasingly infrequent and deep watering in the second, third and fourth years. Irrigation in most locations would be by drip. Irrigation tubing and pipe would be removed from the site at the end of the establishment period. Overhead spray irrigation systems would be used for areas with high density plug plantings. Plantings in the bank zone would be irrigated for two years. Plantings in the terrace zone would be irrigated for 3 years. Upland zone plantings would be irrigated for 4 years.

Irrigation water source may be provided by the contractor from a well developed on site. The well should be located above the 100-year floodplain. At the end of the maintenance period the well should be abandoned per local regulations

5.2.4.4 Establishment/Maintenance

An establishment and maintenance program would be a critical component of a successful revegetation program. The maintenance period for establishing the plants would be for 2-4 growing seasons after installation depending on zone. Zones closest to the stream require shorter maintenance due to decreased depth to groundwater in dry seasons. Maintenance items would include: weed control, irrigating plants, planting upkeep, and some minor re-planting efforts. Monitoring and reporting of the project would be required for each year along with three yearly reports.

5.2.4.5 Weed Control

During the establishment phase, a regular weed control program shall be implemented including the appropriate use of herbicides, mechanical, and hand weed control methods. The area immediately around each planting location (within 36-48") would be kept free from weeds by herbicide application and by hand weeding. This is especially important in the first and second years of establishment and increasingly less important in the third and fourth years. Weeds outside the immediate vicinity of the plant locations would be controlled by mowing and by timed nonselective, pre-emergent and/or selective broadleaf herbicide applications in the first and second growing seasons. Application may be by broadcast or by spot depending on extent of weed infestation.

5.2.4.6 Operations, Monitoring and Maintenance of Vegetation

A simplified monitoring program shall be developed and implemented during the construction period. All hand planted species in the irrigation rows should be monitored, as well as the grasslands to determine restoration establishment success. The monitoring program shall be developed and carried out by experienced biologists, and at a minimum consist of the following: (1) plant survival counts in spring and fall (by species and area). (2) photographs (Permanent color photograph stations); (3) yearly reports.

5.2.5 SLOPE STABILITY

The actual size of the notch would be based on further geotechnical analysis that would be done during the Design and Implementation Phase for construction. Slope stability and new stability measures to be put in place must be based on further analysis and field exploration during the Design and Implementation Phase. Currently, it is anticipated that 2 rows of 11 reinforcing screw anchor nails (geotechnical slope stability tools) will be placed through the dam site. These will be installed 50 to 100 feet into the ground based on their starting position. The actual number of rows of anchors will be determined upon completion of the final investigation and design.

5.3 RISK AND UNCERTAINTY

There are three primary areas of uncertainty and/or risk for this project. They include: (1) the disposal location for the dam material and accumulated sediment; (2) project site slope stability; and (3) post project natural sediment transport to downstream areas and the potential for induced flooding. To every extent possible during the feasibility phase, the PDT has evaluated these areas of risk and uncertainty. Below is a description of the areas of risk and uncertainty, assumptions that have been made regarding these areas, and the status of resolution. In every case, further evaluation is recommended in the Design and Implementation Phase.

5.3.1 DISPOSAL AND REUSE LOCATION

As of May 2006, the City and the Corps' PDT made the decision to move forward with plans to utilize the Lower Reservoir with the understanding that the City would further their investigations to determine if this was a feasible option for construction initiating in 2007. There are many reasons for using the Lower Reservoir. These reasons include the following: (1) it is located only 5,000 feet from the project site; (2) it is owned and operated by the City; and (3) the City could stockpile this material at the Lower Reservoir for eventual reuse.

However, a later preliminary grading plan showed that the Lower Reservoir could not accept all of the project material. In response to this comment, the Corps PDT further investigated disposal options at Clover Flat, a permitted landfill that is located within 9 miles of the project site, for a portion of the dam material and accumulated sediment. Currently, it is expected that 75% or the total project material (29,180 cubic yards) will be taken to the Lower Reservoir and 25% (9,730 cubic yards) will be taken to Clover Flat. These disposal options, as well as other opportunities, will be further evaluated in the Design and Implementation phase. Ultimately, the disposal decision will be the choice of the construction contractor.

5.3.2 SLOPE STABILITY CONCERNS

Maintaining the stability of the adjoining Spring Mountain Road is considered as a project constraint that must be addressed adequately to achieve project success. To the extent possible in feasibility studies, slope stability concerns have been incorporated into the design of the recommended alternative and the Corps' PDT works closely with the City's geotechnical engineer to ensure that both parties are satisfied with the design and monitoring plans.

Additionally, a monitoring program should be implemented to quantify actual ground movement and stability at the project site. The primary objective of this program would be to obtain information that would allow us to evaluate the magnitude of deformations that may develop during and after removal of a portion of the dam. The monitoring period would be for a 6-month duration, which is typical for end-of-construction condition. Please see the Geotechnical Engineering appendix for more information.

5.3.3 SEDIMENT TRANSPORT AND DOWNSTREAM FLOOD IMPACTS

All watersheds yield sediment (clay, silt, sand, gravel, cobble, etc.) and sediment deposition on alluvial fans (valley bottoms) is a natural process. The gradient of the stream above the City is relatively steep and the stream has relatively high capacity to move sediment in the downstream direction. The reach through the Valley is less steep and has less capacity to move sediment in the downstream direction. It is possible that more natural deposition patterns could increase flooding potentials in the downstream areas of York Creek by reducing capacity of lower York Creek to convey flood flows.

The recommended alternative would modify the dam that currently blocks natural sediment transport to downstream reaches of York Creek and allow for natural sediment transport thought the project site. Under proposed project conditions, sediment that is now trapped behind the dam each year, would be transported downstream to the Napa Valley reach of York Creek. The majority of the sediment will be transported to the Napa River.

According to the Corps' July 2006 Lower York Creek Existing Conditions Assessment and Dam Removal Impacts assessment, a significant percentage of the sediment could be deposited on the bottom of York Creek in the Napa Valley Reach (USACE, 2006). It is possible that creek capacities in this area would be reduced as sediment that was once deposited behind York Creek Dam, falls out in these flatter areas and the creek channel reaches a new equilibrium. During high rainfall years, an estimated 2,000 cubic yards of sediment could be deposited in York Creek from its confluence with the Napa River in a location lone mile upstream (USACE, 2006). If a bottom width of 10 feet is assumed, sediment deposition of one foot could be deposited throughout the lower one mile of York Creek. One foot of sediment could raise the water surface elevations during maximum capacity events by and estimated .5 feet (USACE. 2006).

The Assessment offered several preliminary treatments for future consideration. These include: (1) trim riparian vegetation to reduce channel roughness; (2) remove instream obstructions; (3) construct a 1-3 foot tall levee of floodwall in low capacity areas; (4) widen the channel in low capacity areas; (5) regrade and/or contour so sheet flows are channeled back towards the creek in an area of higher capacity (USACE, 2006).

The reduction in channel capacity is currently not expected to increase flood duration or flood depth when compared to the existing condition. A more thorough analysis of floodplain depths and flood duration for existing conditions and project conditions will be completed for final design. Modifications to project design and operations and maintenance will be made to minimize any impact. If further analysis shows that downstream property is negatively impacted by the project, a Corps' Real Estate Takings Analysis would be necessary and will be completed.

As the project non-Federal sponsor, the City understands the project's risks and uncertainties and has committed to establishing a baseline condition for sediment transport and hydrological conditions for York Creek downstream of the project site. The City assumed the responsibility for this need and is working with to evaluate pre-project baseline conditions, which will then be used during the design phase to predict potential changes in the channel morphology because of the project's implementation. The City will develop a monitoring plan to track deposition, aggradation, and induced flooding from the project and will actively manage post-project conditions to maintain flood control downstream of the project area.

5.4 CONSTRUCTION CONSIDERATIONS

5.4.1 SITE PREPARATION

Two existing access roads to the Upper York Creek Dam bed from public road are still barely visible. Both roads require improvements before it can accommodate heavy equipment traffic for this project. One of the access roads is a simple gravel path while the other, from the top of the dam, is in better shape. The major work around the dam bed area would be carried out by either earth moving equipments or the hauling trucks.

5.4.2 CONSTRUCTION WINDOW

Construction activities in the project area would occur from June to October during daylight hours, beginning after 8 AM and ending before sunset each day. Night work would not be allowed. Sediment hauling on Spring Mountain Road would be completed by October 15th coinciding with the end of the construction window for streams supporting salmonids.

5.4.3 EQUIPMENT FOR CONSTRUCTION

Equipment for construction would generally be the choice of the contractor. Guidelines for equipment based on best management practices would be further considered during Design and Implementation Phase. The equipment mentioned in this section has been developed for feasibility level cost estimation.

5.4.4 PROJECT SITE DEWATERING

Dewatering of the sediment basin is necessary to provide dry land for construction work, such as sediment removal, channel contouring and dam removal. The type of cofferdam shall be selected by the contractor. Guidelines for dewatering based on best management practices would be further considered during Design and Implementation Phase. The methods mentioned in this section have been developed for feasibility level cost estimation.

There are several ways to accomplish dewatering and the appropriate solution depends on the stream water flow rate, site topographic condition, and designed operational objective. Given the magnitude of work to be performed in the Upper York Creek project area, complete isolation of the water from the creek bed appears to be necessary for construction. One solution is the use of a cofferdam. The construction of a cofferdam would prevent water from entering the sediment basin work area. A cofferdam is an impermeable structure constructed with material such as rock, sandbags, wood, sheet metal, and/or gravel. Cofferdams can also be constructed by different methods or materials, such as Fas-Dam which is available commercially. A cofferdam at this project site in combination with a bypass channel or a piping mechanism would divert water flow around the sediment basin and would likely be passed through the spillway to below the dam.

5.4.5 PRESERVATION OF EXISTING VEGETATION

Existing native vegetation to be preserved shall be surrounded by protective fencing near construction areas requiring vehicular access or access by mechanized construction equipment. Existing sensitive State or Federally listed threatened or endangered plant species and adjacent existing native plant communities located within the project limits or adjacent to access routes shall be surrounded during construction by protective fencing.

5.4.6 EROSION CONTROL

Permanent erosion control vegetation in habitat areas would consist of native vegetation. Erosion control for disturbance from construction activities outside habitat areas would consist of exotic and/or native grasses best suited for the particular areas needing protection. The following information is described in detail in Appendix G: Habitat Revegetation Report.

5.4.6.1 Storm Water Runoff Erosion

A Storm Water Prevention Plan (SWPPP) would be provided with the Design and Implementation phase that specifies minimum acceptable erosion and sedimentation Best Management Practices (BMP's). The SWPPP also outlines the procedures for complying with National Pollution Discharge Elimination System (NPDES) pollution prevention requirements and permitting. NPDES laws require all construction projects over one acre in size to comply with local NPDES permitting requirements. In California, this means that erosion and sediment control BMP's must be in place during the rainy season.

5.4.6.2 Erosion Control Best Management Practices

Erosion controls BMP's would consist of seeding permanent native vegetative cover in all areas. Areas disturbed by construction with steeper topography that generate sheet flow would receive appropriate erosion control BMP's, such straw mulch, bonded fiber matrix hydromulch, and erosion control fabric etc. in addition to the vegetative cover. Areas disturbed by construction with topography that concentrates flow or conveys concentrated off site run-on would receive erosion BMP's, such straw mulch, bonded fiber matrix hydromulch, cobble dissipaters and erosion control fabric etc., in addition to the vegetative cover.

Sedimentation control BMP's would consist of straw rolls, silt fences and/or sedimentation ponds, which would be implemented where necessary to prevent discharge of sediment-laden runoff into receiving waters.

5.4.6.3 Rainwater Erosion on Engineered Embankments

Where rock is not present, erosion from rainfall runoff would need to be controlled by establishing erosion control grasses on these surfaces. During the time that grasses establish in the first season after seeding, temporary erosion control would be provided by straw mulch with tackifier. A sufficient overburden of soil would need to be designed into the embankments to allow ripping and cultivation of soil of the compacted surfaces to allow grasses to thrive. Native and non-native species may be used, as the highly compacted soils limit species choice. These harsh conditions require use of grasses adapted to drier conditions and poorer soil than the immediately surrounding area.

5.4.6.4 Erosion Control Grass Seeding

Grass mixes would be applied by hydroseeding or broadcast seeding. Hydroseeding shall be by a two step process, where seed fertilizer and a minimal amount of hydromulch is applied. This is followed by a second heavier application of hydromulch. Two step hydroseeding processes ensure better contact of the seed with soil and offer more protection of the seed from drying. Hydromulch should be made of wood fiber, not recycled paper as the recycled paper type of mulch forms a crust which inhibits grass growth and water penetration. Tackifier should be an organic, non ashpaltic type, derived from plantago plants. Native grass mixes would be applied with mycorhizal inoculum applied at the same time the seed is applied.

5.4.7 TRAFFIC IMPACTS FROM CONSTRUCTION

Most of the truck traffic, would result from hauling sediment, moving boulders to the project site for construction, and hauling gravel and cobble material for construction.

For disposal, it is expected that 3 dump trucks will be adequate for disposal at the Lower Reservoir and 6 trucks for disposal at Clover Flat. Each truck can carry 12.5 cubic yards of materiel. Trucks disposing at the Lower Reservoir will be capable of hauling 600 cubic yards per day with 48 daily trips. Similarly, trucks disposing at Clover Flats will be capable of hauling 600 cubic yards per day with 48 daily trips.

Assuming that 75 % of the truckloads will be taken to the Lower Reservoir and 25% of the loads will be taken to Clover Flat, there will be a minimum of 66 days of disposal truck traffic. It will require approximately 3,114 truck trips and will result in approximately 17,910 total miles of road use. More specifically, Clover Flat disposal will result in approximately 13, 240 miles of road use and disposal at the Lower Reservoir will result in approximately 4670 miles of road use.

This traffic is expected to put pressure on the normally narrow and bucolic Spring Mountain. Hauling traffic through St. Helena and on Spring Mountain Road has the potential to cause temporary impacts to traffic along the hauling route. Trucks turning in and out of the project site may also cause traffic hazards. Traffic control would be required as would haul time restrictions (or a hauling window) to allow local residents and businesses reasonable and safe access to roads.

The following measures would reduce project-related traffic impacts:

- The contractor shall prepare a traffic control plan and provide a copy for Caltrans review and approval. The plan shall identify the following: staging areas; dump sites; operating hours; project duration; scheduling; phasing; the total number and type of construction vehicles; and respective vehicle haul routes per project phase.

- A minimum of 2 flaggers would be necessary. Beginning in mid-September, hauling traffic will be subject to potential delays and re-routing as wine production traffic increases during harvest and crush
- Hauling along State Routes 29 and 128 shall be limited to off-peak hours (between 9:00 AM and 3:00 PM) to the extent possible.
- The contractor would be required to provide standard Caltrans traffic controls for trucks entering and leaving the roadway.
- To minimize wear on roads, dump trucks would be filled such that their maximum weight is 10% less than the legal limit of 60,000 pounds on Spring Mountain Road.
- The City and County would evaluate degradation of road conditions by surveying and documenting road conditions before and after project implementation.

5.4.8 HTW CONSIDERATIONS

Innovative Technical Solutions, Inc. (ITSI) conducted an Hazard and Toxic Waste assessment (HTW) at the project site. The following recommendations have been developed as a result of the HTW assessment:

- No areas requiring remediation before construction were identified.
- Concentrations of asbestos were much higher in the dam samples (serpentintinite-rich) than in samples of sediments (poor in serpentinite). The presence of asbestos in samples of the earthen dam and sediment bed at York Creek would necessitate the adoption of specific BMPs. Generally, BMPs would include the following
    a. The maintenance of adequately wetted conditions to prevent the release of asbestos fibers into the air; run-off and mud control; upwind, downwind, and personal exposure air monitoring
    b. Asbestos-specific training for site workers. Different operational requirements apply, depending on whether sites are less than or greater than one acre in size, and whether site operations are construction or grading versus quarrying or surface mining. However, because the ACM is naturally occurring, a California-licensed asbestos contractor <u>would not</u> be required to excavate the site.
- Re-use of materials from the earthen dam for surfacing applications, e.g., roads, parking lots, near-surface filling (less than six inches deep), or use in concrete or mortar, is prohibited, based on reported asbestos detections of greater than 0.25 percent.
- Based on low asbestos concentrations in samples of the sediment bed, the sediments may possibly be suitable for re-use in surfacing applications. However, additional sampling and analysis would be required to fully characterize materials for surfacing applications, per California regulations. Assuming a weight of 12,000 tons for the sediment bed, additional analyses of four three-way composite samples would be required.

5.5 REAL ESTATE REQUIREMENTS

5.5.1 TOTAL LANDS REQUIRED

The total lands required for the project are 3.04 acres in fee title, 1.55 acres for road easements, and 3.44 acres for temporary work area easements. All lands are provided by the non-Federal sponsor.

5.5.1.1 Dam/Spillway-Restoration Site

The property for the dam/spillway-restoration site is a single parcel of 27.35 acres. The dam and spillway are located at the easterly end of this long and narrow parcel. This land lies within the creek channel in the immediate vicinity of the dam and spillway.

5.5.1.2 Lower Reservoir and Project Staging Area Site

Portions of two parcels that adjoin the St. Helena Lower Reservoir will be used for construction staging and long-term storage for sediment that is removed from the restoration area and for road access from Spring Mountain Road to the storage area. A 200,000-gallon water storage tank is located on the southwestern portion of the property. The balance of these lands is undeveloped as they serve as a buffer area for the reservoir.

Table 5.2. Land Value

Feature	Estate	Acreage	Owner	Land Value
Dam Removal	Fee	3.04 acres	City of St. Helena	$54,720
Temporary Road Access	Temporary Road Access Easement	1.55 acres	City of St. Helena	$10,850
Construction Staging Area	Temporary Work Area Easement	3.44 acres	City of St. Helena	$57,792

5.5.2 BASELINE COST ESTIMATE

A gross appraisal was prepared for this property at the October 2005 price levels. The land cost estimates are based on this report. All lands, regardless of ownership, have been estimated at fair market value. There is no difference between State and Federal rules in the valuation of the lands to be acquired.

Table 5.3. Baseline Real Estate Cost Estimate

Non-Federal	Federal	LERRDS	Total

NA[7]	$93,500	$167,000	$260,500

5.5..3 TAKING ANALYSIS

A Taking Analysis is presently being considered and will be prepared for the final report. However, considering the current and anticipated flooding (frequency, depth, and duration) there are no anticipated "takings" being considered at this time.

5.6 MONITORING AND ADAPTIVE MANAGEMENT

Project monitoring would be necessary to understand and accommodate for known and unknown risks and uncertainties and to ensure project success. Project monitoring would occur prior to initiation of construction, during construction, and after completed construction.

During the Design and Implementation phase, criteria would be determined to evaluate the levels of risk and uncertainty. For any area that could require adaptive management during construction, the expected criteria would be defined for the contractor. These criteria would be the responsibility of the contractor to meet. Beyond the construction period, all monitoring and adaptive management would be the responsibility of the Non-Federal Sponsor.

Likely areas of monitoring and adaptive management would include the following:

- Track the geophysical evolution of the project and assess the impact to the downstream environments (Ground surveys);
- Assess water transport and sediment transport in York Creek (Ground surveys, hydraulic modeling, stream gaging with sediment sampling or turbidity measurements)
- Gauge changes to slope stability;
- Monitor and evaluate the physical evolution and wildlife use of restored habitats. (Biological surveys)

Specific detailed monitoring actions would be identified during design in the during the Design and Implementation phase.

5.6.1 PRE-CONSTRUCTION MONITORING

In order to establish the baseline conditions, a site-wide survey would be conducted before the start of construction. The site-wide survey would include biological monitoring such as fish, avian, invertebrate and vegetation surveys as well as topographic surveys and hydraulic modeling. All further monitoring information collected during the project life would be

[7] Because the non-Federal sponsor has owned the property for more than 5 years, they are prohibited from receiving credit for administrative costs associated with their requirement to provide the lands.

compared to the baseline data as part of the decision-making process. The results of the monitoring period determine if impacts are positive or negative. Perceived negative impacts to wildlife, vegetation, or flood capacity in comparison to the baseline would be addressed by specific adaptive management actions.

5.6.2 GEOTECHNICAL SLOPE STABILITY MONITORING

As mentioned previously, maintaining the stability of the adjoining Spring Mountain Road is considered as a project constraint that must be addressed adequately to achieve project success. On this basis, a monitoring program should be implemented to quantify actual ground movement and stability at the site. The primary objective of the monitoring program is to obtain information that would allow us to evaluate the magnitude of deformations that may develop during and after removal of portion of the dam. The monitoring period would be for a 6-month duration, which is typical for end-of-construction condition.

5.6.3 ADAPTIVE MANAGEMENT

Adaptive management is a means to alleviate uncertainties that may be associated with restoration design or specifications. For the Upper York Creek project, the adaptive management plan would provide for distinct actions that may be taken given the performance of the project at any given time during construction. Adaptive management would be incorporated into the construction contract based on criteria established during Design and Implementation Phase. Any changes to construction would be the responsibility of the construction contractor. For CAP projects, the Corps is not authorized to share in the costs of adaptive management once construction is completed; these costs would be the responsibility of the non-Federal sponsor.

5.6.4 PERIOD OF MONITORING AND ADAPTIVE MANAGEMENT

The Corps involvement in monitoring would be limited to no more that five years after completion of physical construction. The costs of monitoring shall be included in total project costs and shared with the non-Federal sponsor. These costs can not exceed one percent of the cost of the features that are to be monitored minus the cost of monitoring, unless a waiver is obtained.

Continued monitoring after the five-year period would be the responsibility of the non-Federal sponsor. As a component of their OMRR&R duties, the non-Federal sponsor would assume sole (i.e., non cost-shared) responsibility for operation and maintenance of the project beyond the five year monitoring and adaptive management period. Routine inspection and maintenance of the project post-construction would not be considered part of monitoring and adaptive management and would be considered part of OMRR&R.

5.7 OPERATIONS, MAINTENANCE, REPAIR, REHABILITATION, AND REPLACEMENT CONSIDERATIONS (OMRR&R)

Upon completion of construction of the recommend plan, and concurrent with the monitoring and adaptive management period, routine operation and maintenance would commence. Routine operation and maintenance would include sediment removal operations, channel maintenance, inspections, repairs, maintaining vegetation and removal of invasive exotic vegetation, where feasible. The costs associated with OMRR&R would be the responsibility of the non-Federal sponsor.

5.8 PROJECT BENEFITS

Below, Table 5.3 summarizes the upstream ecosystem restoration benefits for the project alternatives.

Table 5.4. Ecosystem Restoration Benefits for Recommended Plan

Upstream Ecosystem Benefit Units		
Potential Steelhead Carrying Capacity	**Percentage Effectiveness for Steelhead Passage**	**Total Ecosystem Benefits**
1800	100%	1800

5.9 ECONOMIC SUMMARY

The cost estimate for the recommended plan is presented Table 5.3.

Table 5.5. Recommended Plan Economic Outputs (FY 2006 Price Levels)

Cost Items	Recommended Alternative
Benefits	
Ecosystem Benefits	1810
LERRDs	
Land Acquisition	$167,000
Federal Administration Cost (non credit)	$93,500
LERRDs Subtotal	$260,500
Plans and Implementation Phase	
Geotech	$80,000
Water Resources	$100,000
Environmental Compliance	$50,000
Other	$20,000
P&I Phase Subtotal	**$250,000**
Construction Phase	
Construction	$4,884,599
Engineering During Construction	$150,000
Supervision & Administration	$350,000
Cultural Resources	$30,000
Construction Phase Subtotal	*$5,925,099*
Monitoring & Adaptive Management	$208,266
TOTAL FIRST COST	$6,133,365
Total Costs	
TOTAL FIRST COST	$6,133,365
Interest during construction	$384,659
TOTAL GROSS INVESTMENT	$6,518,024
Total Cost of Maintenance (OMRR&R)	$1,037,258
TOTAL COST	$7,555,282
Annual Costs	
Annual Costs of Total Gross Investment	$435,205
Annual Cost of Maintenance (OMRR&R)	$20,745
Total Annual Costs (AAC)	$455,950
Average Annual Cost per Ecosystem Benefit	**$240**

5.9.1 MONITORING AND ADAPTIVE MANAGEMENT COSTS

The Federal participation in monitoring would be limited to a five-year period after construction, and adaptive management should be accomplished within that period. At this time the specifics of the monitoring and adaptive management plan have not been defined, therefore a limit of two percent (2%) and three percent (3%) for each item, respectively, is included based on current policy on maximum Federal interest.

Construction and post-construction monitoring and adaptive management would be cost-shared 65/35 with the non-Federal sponsor. If an adaptive management construction need is identified during the adaptive management period, the activity would be cost shared regardless of the appropriation situation and regardless of when it is constructed; the non-Federal sponsor would expect reimbursement for building these features without Federal funds if appropriations do not keep up with funding needs. If the need is identified after the adaptive management period, then the non-Federal sponsor would be responsible for the costs.

5.10 NATIONAL SIGNIFICANCE

Environmental restoration is a priority in the Corps of Engineers budgeting process for the Civil Works water resource development program. In contrast to more tradition project outputs, many of the outputs of environmental restoration projects cannot be measured in monetary terms. Without the option of quantifying environmental outputs in monetary terms, other criteria must be considered for evaluating and justifying environmental restoration projects. One such criteria is the “significance” of the environmental resource(s) associated with such projects. For this purpose, resource significance can be described in terms of Institutional, Public, and Technical significance.

5.10.1 INSTITUTIONAL SIGNIFICANCE

Institutional Significance means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups.

Upper York Creek Dam has been identified as a significant obstacle to passage for the federally listed, threatened, CCC steelhead. York Creek has also been designated as critical habitat for threatened CCC steelhead by the National Marine Fisheries Service. The removal or breeching of Upper York Creek Dam would open approximately 2 miles of suitable upstream habitat for steelhead.

The following public agencies are supportive of the Upper York Ecosystem Restoration project and have provided input during the planning process: California Department of Fish and Game (DFG); California Regional Water Quality Control Board (RWQCB); City of St. Helena (City); Department of Water Resources (DWR); Napa County Resource Conservation District (NCRCD); National Marine Fisheries Service (NMFS), and the United States Fish and Wildlife Service (USFWS).

5.10.2 TECHNICAL SIGNIFICANCE INSTITUTIONAL

Technical significance means that the importance of an environmental resources is based on the scientific or technical knowledge or judgment of critical resource characteristics. Below is a discussion of technical significance for Upper York Creek.

In California, steelhead were once abundant in coastal and Central Valley Rivers and streams. A rough estimate of the total statewide steelhead population is 250,000 adults. This is less than half the population of 30 years ago. The major factor causing steelhead population decline is freshwater habitat loss and degradation. This has resulted from three main factors: inadequate stream flows, blocked access to historic spawning and rearing areas due to dams, and human activities that discharge sediment and debris into waterways.

The Napa River basin is known to contain 27 species of freshwater fish, 14 of which are native and 13 are exotic species that have been intentionally or accidentally introduced (Stillwater Sciences, 2002; Moyle, 2002). Historically, the basin likely supported three salmonid species: chinook salmon, steelhead, and coho salmon; coho salmon are considered extirpated within the basin.

Historically, large runs of steelhead trout made their way up the Napa River to spawn in its tributaries. In terms of population size and geographic distribution, steelhead are the most significant salmonid species within the watershed. Napa River steelhead populations have been greatly reduced from historical levels. It is estimated that the Napa River watershed supported a population of approximately 8,000 adult steelhead as recently as 100 years ago. The current steelhead population is unknown due to a lack of quantitative data. Recent basin wide surveys estimate the population to be between 200 and 1,000 adult steelhead (Stillwater Sciences, 2002; EcoTrust, 2001). Despite reduced populations, the Napa River watershed is considered one of the most significant anadromous fish streams within San Francisco Bay (Leidy et al., 2005) (NCRCD, 2005).

Upper York Creek Dam has been identified by NMFS as a completely impassable barrier to approximately 2 miles of upstream migration and spawning habitat for steelhead. The channel of York Creek that is impacted under the current conditions is known to provide spawning and rearing habitat for CCC steelhead. The dam also blocks access for resident fish and other aquatic wildlife to suitable aquatic habitat above and below the dam.

A 2005 Salmonid Habitat Report by the NCRCD found that overall, York Creek is one of the most significant spawning and rearing streams for steelhead within the Napa Basin. Specifically, the upper reaches of York Creek offer excellent rearing and spawning habitat, and creating access to these areas would greatly benefit the overall steelhead population. Additionally, electrofishing efforts by Stillwater Sciences in 2005 and surveys by NMFS and DFG have determined that rainbow trout are also present above the Upper York Creek Dam and Reservoir. These populations could become anadromous if given the opportunity (NCRCD, 2006).

5.10.3 PUBLIC SIGNIFICANCE

Public Significance means that some segment of the general public recognizes the importance of an environmental resource. Below is a discussion of public significance for Upper York Creek.

Generally, the PDT has worked closely with the City and public agencies in an effort to ensure that the public's best interests were considered during the feasibility phase of this project. However, the general public has not been directly involved with this project and recent efforts have been taken to ensure public awareness during the public review and comment period that will be conducted for 30 days beginning in July 2006.

5.11 PROJECT JUSTIFICATION

The Recommended Plan is considered justified based on the significance of the non-monetary benefits as compared to average annual costs. The average annual cost per habitat unit is $240. The ecosystem benefits are considered significant as the approximately 2 miles of upstream aquatic habitat would provide spawning and rearing habitat for the federally listed steelhead *(Oncorhynchus mykiss*). Under the current conditions, York Creek is known to be one of most significant spawning and rearing streams for steelhead within the Napa River Watershed Basin for steelhead.

6.1 GENERAL

This Chapter presents information on the Federal and non-Federal requirements for implementing the recommended plan. It presents the required cost sharing and other requirements for the construction of the project including adaptive management and monitoring and operation, maintenance, repair, rehabilitation, and replacements over the life of the project. It also presents the schedule for implementation including activities to complete the feasibility, design, and construction phases. Finally, it presents the Sponsor's support for the project and financial capability to meet their required contributions.

6.1.1 DIVISION OF PLAN RESPONSIBILITIES

The apportionment of the first cost between Federal and non-Federal interests is based on applying the requirements of current Federal laws and policies, as defined in Section 210 of the Water Resources Development Act of 1996 for Ecosystem Restoration projects.

6.1.1.1 Federal Responsibilities

The Federal Government would provide 65% of the First Cost of implementing the Recommended Plan including pre-construction Design and Implementation Phase, construction and construction management, monitoring, and adaptive management. The total Federal share of these costs is estimated to total $3.64 million. In addition to its financial responsibility, the Federal Government would:

Design and prepare plans and specifications for construction of the Recommended Plan; and Administer and manage contracts for construction and supervision of the project after authorization, funding, and execution of a PCA with the City of Saint Helena.

The Federal participation in monitoring would be limited to a five-year period after construction, and adaptive management should be accomplished within that period. At this time the specifics of the monitoring and adaptive management plan have not been defined, therefore a limit of two percent (2%) and three percent (3%) for each item, respectively, is included based on current policy on maximum Federal interest.

6.1.1.2 Non-Federal Responsibilities

The City of Saint Helena would be responsible for providing 35% of the First Cost of implementing the Recommended Plan or separable element. These costs include pre-construction engineering and design, and construction of the ecosystem restoration features including monitoring and adaptive management. The non-Federal sponsors shall also provide 100 percent of the costs for lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs) that are required for implementation or operation and maintenance of the project. The value of LERRDs shall be

included in the non-Federal 35 percent share. If the Government determines that the LERRDs costs exceed the non-Federal sponsors 35 percent share, the sponsor would be reimbursed for the value of LERRDs which exceeds their 35 percent share. The estimated cost to the non-Federal sponsor is $2,146,678, including $16,000 in LERRDS credit.
No portion of this project would be considered a betterment.

6.1.1.3 Federal and Non-Federal Costs

Table 6.1 presents the breakdown of Federal and non-Federal project costs associated with the Recommended Plan.

Table 6.1. Recommended Plan Cost Apportionment

Cost Items	**Federal Cost**	**Non-Federal Cost**	**Total Cost**
LERRDs			
Land Acquisition	0	$167,000	$167,000
Structures Acquisition	0	$0	$0
Relocations & Replacements	0	$0	$0
Federal Administration costs	$93,500	$0	$93,500
Subtotal LERRDs	**$93,500**	**$167,000**	**$260,500**
Plans and Implementation Phase			
Geotech	$80,000	$0	$80,000
Water Resources	$100,000	$0	$100,000
Environmental Compliance	$50,000	$0	$50,000
Other	$20,000	$0	$20,000
P&I Phase Subtotal	**$250,000**	$0	**$250,000**
Construction Phase			
Construction	$4,884,599	$0	$4,884,599
PED	$250,000	$0	$250,000
Engineering During Construction	$150,000	$0	$150,000
S&A	$350,000	$0	$350,000
Total Project Construction Cost	$5,728,099	$0	$5,728,099
Cultural Resources	$30,000	$0	$30,000
Monitoring	$208,266	$0	$208,266
Subtotal First Cost	$5,966,365	167,000	$6,133,365
Adjustment for 65/35 Cost Share	-1,979,678	$1,979,678	
TOTAL FIRST COST	**$3,986,687**	**$2,146,678**	$6,133,365
PERCENT OF FIRST COST	65%	35%	100%
TOTAL CASH CONTRIBUTION	$3,986,687	$1,979,678	$5,966,365

6.1.1.4 Fully Funded Costs

The fully funded estimate for the Recommended Plan includes price escalation using Office of Management and Budget inflation factors. Project funding requirements by fiscal year are summarized in Table 6.2, as fully funded estimates.

Table 6.2. Funding by Fiscal Year ($000)

Cost Items	Federal Cost	Non-Federal Cost	FY07	FY08	FY09	FY10-12	TOTAL
LERRDs							
Land Acquisition	$0	$167,000	$167,000	$0	$0	$0	$167,000
Structures Acquisition	$0	$0	$0	$0	$0	$0	$0
Relocations & Replacements	$0	$0	$0	$0	$0	$0	$0
Federal Administration costs	$93,500	$0	$33,000	$40,000	$20,500	$0	$93,500
Subtotal LERRDs	$93,500	$167,000	$200,000	$40,000	$20,500	$0	$260,500
Construction Cost-Sharing Features							
Construction	$4,884,599	$0	$900,000	$3,484,599	$500,000	$0	$4,884,599
Design and Implementation Phase	$250,000	$0	$250,000	$0	$0	$0	$250,000
Engineering During Construction	$150,000	$0	$50,000	$100,000	$0	$0	$150,000
S&A	$350,000	$0	$175,000	$150,000	$25,000	$0	$350,000
Total Project Construction Cost	$5,728,099	$167,000	$1,575,000	$3,774,599	$545,500	$0	$5,895,099
Cultural Resources	$30,000	$0	$30,000	$0	$0	$0	$30,000
Monitoring	$208,266	$0	$50,000	$58,266	$50,000	$50,000	$208,266
Subtotal First Cost	$5,966,365	$167,000	$1,655,000	$3,832,865	$595,500	$50,000	$6,133,365
Adjustment for 65/35 Cost Share	($1,979,678)	$1,979,678					
TOTAL FIRST COST	$3,986,687	$2,146,678	$1,655,000	$3,832,865	$595,500	$50,000	$6,133,365
PERCENT OF FIRST COST	65%	35%	27%	63%	9%	1%	100%
TOTAL CASH CONTRIBUTION	$3,986,687	$1,979,678	$1,488,000	$3,832,865	$595,500	$50,000	$5,966,365
TOTAL	**$3,986,687**	**$2,146,678**					**$6,133,365**

6.1.1.5 Cultural Resources, Monitoring, and Adaptive Management Costs

The Federal participation in monitoring would be limited to a five-year period after construction, and adaptive management should be accomplished within that period. At this time the specifics of the monitoring and adaptive management plan have not been defined, therefore a limit of two percent (2%) and three percent (3%) for each item, respectively, is included based on current policy on maximum Federal interest.

6.1.1.6 Operation, Maintenance, Repair, Rehabilitation, & Replacement (OMRR&R) Costs

The non-Federal sponsor is responsible for providing all requirements and 100 percent of the costs associated with operating and maintaining the project including any repairs, replacements, or rehabilitation of project features that are needed to continue obtaining project benefits. Table 6.3 presents a summary of the OMRR&R costs associated with the Recommended Plan on an average annual basis.

Table 6.3. OMRR&R Costs

Item	Avg. Annual Cost ($)
Channel O&M cost	$17,744.52
Mitigation Measures	$3,001
Sediment Removal	Unknown
Total Average Annual OMRR&R Costs	$20,745.16

6.2 REPORT COMPLETION, SCHEDULE, AND REPORT APPROVAL

Table 6.4 presents the steps and milestones required to complete the feasibility report, obtain project approvals, authorization of construction, final design and construction. The schedule for project implementation assumes approval by USACE South Pacific Division no later than December 31, 2006. After project approval, the project would be eligible for construction funding. Once Congress appropriates Federal construction funds, the Corps and the non-Federal sponsor would enter into a project cooperation agreement (PCA). This PCA would define the Federal and non-Federal responsibilities for implementing, operating, and maintaining the project. Project construction would begin following the certification of the real estate requirements. After construction, the final acceptance and transfer of the project to the non-Federal sponsor would follow the delivery of an O&M manual and as-built drawings.

Table 6.4. Milestone Schedule

Milestones	Schedule
Complete Draft Report	August 2006
Public Review	September 2006
Final Report	October 2006
Division Engineer Notice	October 2006
Execute Cost-Sharing Agreement PCA	November 2006
Complete Design and Implementation Phase	March 2007
Complete Real Estate Acquisition	Dec 2006
Advertise Construction	May 2007
Construction Start	June 2007
Complete Construction	October 2008
Turnover Project to Local Sponsor	October 2008
Initiate Monitoring and Adaptive Management	March 2007
Complete Monitoring and Adaptive Management	August 2010

6.2.1 Construction Schedule

The schedule for project implementation assumes project approval in FY06. After project approval, the project would be eligible for construction funding in FY '07. The project would be considered for inclusion in the Congressional conference budget based on national priorities, magnitude of the Federal commitment, economic and environmental feasibility, level of local support, willingness of the non-Federal sponsor to fund its share of the project cost and budgetary constraints that may exist at the time of funding. Once USACE-South Pacific Division authorizes the project, the Corps and the non-Federal sponsor would enter into a PCA. This PCA would define the Federal and local responsibilities for implementing, operating, and maintaining the project, and is scheduled for execution in FY 2007. The construction schedule is summarized below in Table 6.5.

Table 6.5. Design and Implementation Phase and Construction Schedule

Project Phase	**Start Date**	**Finish Date**
Design and Implementation Phase and Initial Contracting of Construction	Fall 2006	March 2007
Year #1 Construction	June 2007	September 2007
Year #2 Construction:	April 2008	September 2008
Monitoring and Adaptive Management; Stability and Sediment Transport Monitoring	March 2007	August 2010
O&M Maintenance of channel design	August 2010	August 2012
O&M Non-Federal sponsor O&M	August 2012	No end date

6.3 SPONSOR SUPPORT

The City of Saint Helena has expressed the desire for implementing the project and sponsoring project construction in accordance with the items of local cooperation that are set forth in the recommendations chapter of this report.

6.4 FINANCIAL ANALYSIS

The non-Federal share for implementing and maintaining the project is expected to be obtained from a number of sources including State grants and local bond measures. The financial analysis indicates that the non-Federal sponsor is financially capable of participating in the Recommended Plan.

6.4.1 FUNDING SOURCES

The City of Saint Helena operations and programs are funded through a variety of sources including local bond measures and California State grants. The non Federal sponsor's cash contribution for this project would be financed primarily through local water enterprise bonds (Measure A) and CALFED Ecosystem Restoration Program (319H) grants.

I recommend that Alternative 2B: Small Notch plan be authorized for implementation as a Federal project, with such modifications thereof as in the discretion of the Commander, USACE may be advisable. The estimated first cost of the recommended plan is $6,133,365 and the estimated annual OMRR&R cost is $20,745. The Federal portion of the estimated first cost is $3,986,687. The non-Federal sponsor shall, prior to implementation, agree to perform the following items of local cooperation:

a. Provide 35 percent of total project costs allocated to nonstructural flood control and at least 35 percent but no more than 50 percent of total project costs allocated to structural flood control, as further specified below:

(1) Enter into an agreement which provides, prior to execution of the project cooperation agreement, 25 percent of design costs;

(2) Provide, during construction, any additional funds needed to cover the non-federal share of design costs;

(3) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project;

(4) Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project; and

(5) Provide, during construction, any additional costs as necessary to make its total contribution equal the percent of total project costs allocated to nonstructural flood control and at least 35 percent but no more than 50 percent of total project costs allocated to structural flood control.

b. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-Federal sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

c. Assume responsibility of operating, maintaining, replacing, repairing, and rehabilitating (OMRR&R) the project or completed functional portions of the project, including mitigation features without cost to the Government, in a manner compatible with the project's authorized purpose and in accordance with applicable Federal and State laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto.

d. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

e. Hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.

f. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as would properly reflect total project costs.

g. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.

h. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.

i. Agree that, as between the Federal Government and the non-Federal sponsor, the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and, to the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that would not cause liability to arise under CERCLA.

j. Prescribe and enforce regulations to prevent obstruction of or encroachment on the Project that would reduce the level of protection it affords or that would hinder operation or maintenance of the Project.

k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

l. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), requiring non-Federal preparation and implementation of flood plain management plans.

m. Provide the nonfederal cost share of that portion of total cultural resource preservation mitigation and data recovery costs attributable to structural and nonstructural flood control that are in excess of one percent of the total amount authorized to be appropriated for structural and nonstructural flood control.

n. Inform affected interests, at least annually, regarding the limitations of the protection afforded by the project.

o. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

p. Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

q. Agree that any part of the project identified as approved for proposed advanced work for credit under Section 104 of Public Law 99-662 must be compatible with recommended flood control project, and that any credit granted shall not relieve the non-Federal sponsor of its requirement to pay, in cash, 5 percent of total project costs allocated to structural flood control.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted t the Congress as proposals for authorization and implementation funding. However, prior t transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties would be advised of any modifications and would be afforded an opportunity to comment further.

Craig W. Kiley
Lieutenant Colonel, U.S. Army
Commanding

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